

# **Survey of Jet Fuels Procured by the Defense Energy Support Center**



**1990 - 1996**

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**DEFENSE LOGISTICS AGENCY**  
**DEFENSE ENERGY SUPPORT CENTER**  
8725 JOHN J. KINGMAN ROAD, SUITE 4950  
FT. BELVOIR, VA 22060-8222

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**SURVEY OF JET FUELS (1990-1996)**

This first report is a compilation of data which are representative of the quality of jet fuels (JP4, JP5, and JP8) purchased by the Defense Energy Support Center (DESC) worldwide. This information was obtained from our Petroleum Quality Information System (PQIS), an automated system which contains product quality history. This database contains over 6000 records of aviation fuel deliveries, which represents 8.5 billion gallons of product.

The data contained in this report are summarized to provide statistical information on average, minimum and maximum values of selected test properties for use by our customers in researching specification or quality issues.

Although this report covers seven years of quality history, future reports will be published on an annual basis.

Comments and questions of this report and recommendations for future reports are welcome. Please contact Mr Kenneth Henz at Commercial (703) 767-8356 or DSN 427-8356.

W. A. ROBINSON  
Deputy Director  
Bulk Fuels

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Mercaptan Sulfur	13	45	14	46	15	47
Particulate Contamination	16	48	17	49	18	50
Filtration Time	19	51	20	52	21	53
Total Acid Number	22	54	23	55	24	56
Smoke Point	25	57	26	58	27	59
Naphthalenes	-		-		28	60
Hydrogen Content	29	61	30	62	31	63
Distillation 10% Recovered	-		32	64	33	65
Distillation 50% Recovered	34	66	-		-	
Distillation 90% Recovered	35	67	-		-	
Distillation Final Boiling Point	36	68	37	69	38	70
Flash Point	-		39	71	40	72
Cetane Index	-		41	73	42	74
Net Heat of Combustion	43	75	44	76	45	77

## **Section I - Executive Summary**

The Defense Energy Support Center (DESC) purchases fuel in bulk quantity for the military services. Complete specification analyses for each shipment of product on a DESC contract were sent to the DESC quality office for data collection purposes. However, the military services and industry use various reporting formats to transmit the test results. The Office of the Assistant Secretary of Defense, Energy Policy Directorate, in 1989, authorized the establishment of Petroleum Quality Information System (PQIS), which would standardize data entry, be used to track trends in product quality and to resolve quality questions. The initial implementation of PQIS began with aviation fuels (JP4, JP5 and JP8) procured for the military. The first data entry occurred in 1990. Since then, up to and including 1996, the database contains 6093 records of deliveries of aviation fuel to the US Government representing 8.5 billion gallons of product.

**Section I** of this report presents summary data for the number of reports received and the volume purchased by calendar year and region (as defined in *Chart 3*). The assignment of states to region parallels the Petroleum Administration for Defense Districts (PADDs) used by the petroleum industry for statistical purchases. The data shows that almost all the product over the six years was purchased within specification limits. Histograms, which display complete data over all years for each product and fuel property, are summarized in **Section II**. **Section III** provides, for each individual test parameter for an individual fuel, a further breakdown of statistical information in the **Appendix** section as a series of Tables, displaying minimum, maximum, average and volumetrically weighted average data by region and year. Other queries or views of data can be obtained by contacting the Point-of-Contact (POC) listed below.

Military specifications are used to procure the aviation fuels for the US Government. Therefore, the trends noted in this report might not necessarily reflect those seen in industry, since the military fuel is in some cases specially blended to meet the military specifications. Included in this report are test result information obtained from the North Atlantic Treaty Organization (NATO) report for Jet A1 entering the Central European Pipeline System (CEPS) for calendar year 1996. These NATO values can be compared to the JP8 tables in the Appendix for calendar year 1996 and Region 7, which includes Europe. A short summary of data for each property of the aviation fuels is included in **Section III**.

The POC for this report and requests for information from the PQIS database is Mr Kenneth Henz at the following address and telephone number:

Defense Energy Support Center  
ATTN: DESC-BPE (Mr Kenneth Henz)  
8725 John J. Kingman Road  
Ft Belvoir, VA 22060-6222

Telephone: (703) 767-8356 (DSN 427-8356)  
FAX: (703) 767-8366 (DSN 427-8366)  
E-mail: khenz@desc.dla.mil

## **Section II - Introduction and General Information**

### **Background**

In 1987, the Logistics Management Institute (LMI) published a report entitled: "Petroleum Quality Information System (PQIS): Architecture and Design Alternatives" which outlined system requirements and alternatives for a system that would store and process information on the quality of petroleum products procured and used by the Department of Defense (DoD). In February 1988, the Office of the Assistant Secretary of Defense, Energy Policy Directorate, made a request for review and comment on this LMI report to the Services. Responses were collected from March - May 1988, which clearly established the need for a system to track quality trends and to have a standardized method of entering in data electronically. As a result of the survey, the Defense Energy Program Policy Memorandum (DEPPM) 89-1, dated 25 April 1989 was issued which established the requirement for PQIS and designated the Defense Fuel Supply Center (Hereafter referred to as the **Defense Energy Support Center [DESC]**) as responsible for designing the PQIS. PQIS was planned as an automated mainframe information management system that would standardize dissimilar government and private sector quality control and surveillance data reporting formats into a standardized format. The information in the database would be available to DoD personnel for use in identifying, investigating, and resolving fuel related equipment problems.

The DEPPM 89-1 authorized LMI to develop a prototype to be tested and evaluated by DESC. The review was completed in March 1989. Because of funding constraints and the complexity of designing an all-encompassing system, the initial PQIS database system was built around procurement of aviation fuels (JP4, JP5 and JP8). This prototype PQIS system was put into operation in October 1990. The initial system was PC-Based (in DBase IV), not on a mainframe. The first report entered into the database was dated 25 Sep 90. Since that time, the database program was converted to Access 2.0, then Access 7.0. Test reports received from contractors worldwide were entered into the database. There are plans in the near future to expand the system to include other fuels and quality surveillance data.

### **Summary Information**

The data which follows represents **299 individual contracts** over six years, having **6093 data points** total representing a total of **8.54 billion gallons** of JP4, JP5 and JP8. Chart 1 below shows number of shipping tank reports entered per year starting from the last three months of calendar year 1990 through the end of calendar year 1996.

Chart 1

**Total Jet Fuel Entries by Calendar Year**

<b>Fuel</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>Total</b>
JP4	99	843	660	773	274	138	2	2789
JP5	32	254	192	135	56	31	131	831
JP8	7	17	25	157	423	745	1099	2473

The above data in *Chart 1* indicates number of test reports for individual shipping tanks that were received, not the number of shipments made. A single product movement may involve more than one shipping tank, just as many product movements (e.g., truck shipments) could have the same source tank. The quantity shipped from each tank is meant to indicate actual quantity shipped to the US Government under DESC contract at a refinery or terminal from a particular shipping tank, not the total quantity in the Tank at the time of sampling. Thus, this database represents what was actually delivered to DESC

### Chart 2

**Total Volume by Calendar Year of Jet Fuels Delivered**  
(Volume in Millions of Gallons)

<b>Fuel</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>Total</b>
JP4	109.18	1355.14	858.81	681.05	203.11	66.88	0.66	3274.83
JP5	47.80	463.35	376.52	327.51	148.92	33.57	350.29	1747.96
JP8	3.99	12.43	12.70	213.51	531.40	995.60	1749.02	3518.65

customers. The quantity reported on the test report from each shipping tank forms the basis for

### Chart 3

calculating the volumetrically weighted average (See "Use of Terms", page 8, for a definition of

<b>Chart By <u>Fiscal Year</u> of Volume of Jet Fuels Reported and Percentage of Total Volume Purchased*</b> (Millions of gallons)					
<b>JP 4</b>	<b><u>1992</u></b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>
Reported**	1386	575	270	106	0.8
Purchased	2863	2217	704	231	2.6
Percentage	<b>48%</b>	<b>26%</b>	<b>38%</b>	<b>46%</b>	<b>31%</b>
<b>JP 5</b>	<b><u>1992</u></b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>
Reported**	519	202	230	67	246
Purchased	1180	1150	1018	992	1039
Percentage	<b>44%</b>	<b>18%</b>	<b>23%</b>	<b>7%</b>	<b>24%</b>
<b>JP 8</b>	<b><u>1992</u></b>	<b><u>1993</u></b>	<b><u>1994</u></b>	<b><u>1995</u></b>	<b><u>1996</u></b>
Reported**	25	65	451	995	1621
Purchased	374	402	1808	2409	2820
Percentage	<b>7%</b>	<b>16%</b>	<b>25%</b>	<b>41%</b>	<b>57%</b>
*Source: DFAMS Data Files					
** PQIS Database includes only contract procurement purchases.					

volumetrically weighted average) for a specification property. Chart 2 below represents total volume delivered each year for JP4, JP5 and JP8.

Chart 3 below shows by fiscal year (vice calendar year) the volume (in millions of gallons) of fuel purchased according to the DFAMS historical records compared with the total volume in the PQIS database for that same fiscal year. The percentage represents volume of product indicated by the DD 250-series documents in the PQIS database versus the volume of product purchased according to DFAMS. The fiscal year begins in October and ends September of the following year. Percentages in Chart 3 show an increasing compliance trend for JP8, according to comparisons with the DFAMS database, up to almost 60% compliance. Volumes in Chart 3 represent information on complete specification results on the aviation fuels JP4, JP5, and JP8 on a *world-wide* basis focusing on what was shipped to DESC customers.

The ability to group this world-wide data into geographical areas (e.g., Europe, Western US, etc) may be desirable in order to provide a more specific or focused analysis of data for a particular area of interest. For example, a researcher may want to know how the sulfur results vary for the West Coast of the United States versus the East Coast. To assist in this regional type of analysis of characteristics of fuels purchased by the US Government, "regions" were assigned to each state in the United States and geographically in overseas areas. These "regions" are defined in Chart 4, which divides the continental United States along the same lines as the PADDs (Petroleum Administration for Defense Districts).

#### Chart 4

### Regional Assignments for PQIS Report

PAD			
<u>Region</u>	<u>District</u>	<u>Title</u>	<u>States or Countries</u>
1	I	East Coast	ME, VT, NH, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, NC, SD, GA, FL
2	II	East Central	ND, SD, MN, IA, NE, WI, MI, OH, KY, TN, IN, IL, MO, KS, OK
3	III	Gulf Coast	AL, MS, AR, LA, TX, NM
4	IV	West Central	MT, ID, WY, UT, CO
5	V	West Coast	WA, OR, CA, NV, AZ
6		Middle East	Kuwait, Bahrain
7		European	Europe, Israel and Turkey
8		Pacific	Korea, HI, AK, Australia

Since the end of World War II, the Petroleum Administration Districts were used by the Department of Energy to divide the United States into regions for use in statistical analyses (mainly price factors) as a common baseline for calculating and reporting. The use of the PADDs in this report provides the advantage of using an existing common industry reference for comparative statistical purposes.



## Use of Terms

To avoid confusion or misunderstanding in discussions, terms used within this report are used as follows:

- a) **Spectender** - A complete specification analysis report of product being offered for acceptance by the US Government. For fuels, it is the written report of results for full specification testing in the refinery or terminal shipping tank for product offered for acceptance.
- b) **Report** - Represents one spectender tank test result (Complete Specification Test Results), regardless of how many shipments were made out of the tank or if more than one tank was involved in a total loading or product movement.
- c) **Volume** - Total volume, expressed in millions of gallons, delivered to the US Government or other designee from the shipping tank referenced in the report.
- d) **Region** - As defined in Chart 4, refers to the grouping of states and countries based in the continental United States on the PADDs. These regions do not correlate with the Defense Fuel Regions or Offices. Since shipments can originate and terminate in different regions, the determination of the region was chosen based on the refinery location rather than the receipt location.
- e) **Average/Volumetrically Weighted Average** - The average calculation based on volume of fuel purchased rather than each instance of purchase. For example, if one batch of product had an API Gravity of 46.0 with 1,000,000 gallons delivered and another batch had an API Gravity of 43.5 with 500,000 delivered, the average, based on occurrences of test values, would be:

$$(46.0 + 43.5)/2 = \underline{44.75}.$$

The **volumetrically weighted average**, based on volumes of product represented by the test values, would be:

$$(46.1 \times 1,000,000) + (43.5 \times 500,000) / 1,500,000 = (67,750,000 / 1,500,000) = \underline{45.17}$$

The difference between the two averaging methods is 0.42°API. Each method uses a different basis to calculate the average. Both averages are provided in this report.

- f) **NATO/CEPS JA1** - On 3 December 1997, a NATO Unclassified report, authored by Dr. M. A. Silverman, was received at DESC which summarized data for 15 suppliers for Jet A-1 (JA1) received into the Central European Pipeline System (CEPS) for calendar year 1996. The report was published 28 Nov 97 with Reference Number 004387, File No OPS/QC/97:058. Encompassed by this North Atlantic Treaty Organization (NATO) Report are 1,528 complete specification test results representing 1.69 billion gallons of JA1 delivered into CEPS entry points. The test result information was extracted from refinery Certificates of Quality provided for each batch of JA1. The product was delivered to commercial airports and to military air bases in the CEPS area of activity. The results presented in this report are comparable with "Region 7" for 1996 in this annual report. Where appropriate, the results from the NATO Report will be included as a footnote in order to evaluate these trends against worldwide trends. Statements in this report, preceded by "NATO/CEPS JA1", indicates that what follows is information taken directly from the Publication.

## Summary of Data by Region

The next three charts provide a breakdown of the total number of reports received per region and a further breakdown of volume and number of reports received for each product grade. In calendar year 1990, data was collected beginning in September, thus 1990 does not represent the entire calendar year's worth of data. However, 1990 is included as a reference in evaluating trends in test results. In future reports, the years 1990 through 1994 will be dropped for statistical purposes.

Chart 5 below indicates total aviation fuel test reports received by year from each region as an aid in evaluating data presented in this report. Clause E40.05, *Material Inspection and Receiving Report*, requires our contractors to send in a copy of the complete laboratory test reports from each shipping tank used for shipments. The differences among the total number of reports is not necessarily a direct indicator of contractor compliance with DESC contract clause E40.05 which requires copies of the DD-250-series documents to be mailed to DESC. The discrepancies are a function of contract award patterns, amount of fuel needed for a particular period, military deployments, Replacement-in-Kind (RIK) shipments and fuel conversions during the reporting period.

### Chart 5

## Total Reports Received by Year and Region

Year	Region								Total
	1	2	3	4	5	6	7	8	
1990		3	33	33	61			8	138
1991	36	175	554	93	210			46	1114
1992	17	115	459	78	186			22	877
1993		84	596	194	154		20	17	1065
1994		72	348	204	88		10	31	753
1995	30	83	349	150	154		30	118	914
1996	61	120	464	81	226	8	129	144	1232

The values above represent the number of possible data points available for each region for JP4, JP5 and JP8 received and entered into the PQIS database for each report year. Again, the number of occurrences do not directly relate to the number of shipments made during that year since one batch from the refinery tank may have been used for multiple shipments on different orders. Information in Chart 5 is provided as an indication of the responses received from the different regions. The greatest number of reports comes from Regions 2 through 5. Region 3, which includes Texas, leads in the submissions of reports.

Chart 6 below represents the volume of aviation fuels, in millions of gallons, refined each calendar year from the various regions and sold to Department of Defense customers.

Chart 6

**Yearly Regional Breakdown by Fuel of Volume Received**

(Millions of Gallons)

		Region								Total
Year	Fuel	1	2	3	4	5	6	7	8	
1990	JP4		2.21	14.42	28.07	53.31			11.17	109.18
	JP5			14.98		32.82				47.80
	JP8					3.99				3.99
1991	JP4	46.39	199.99	803.84	55.02	190.39			59.51	1355.14
	JP5		5.88	298.50		158.98				463.35
	JP8					8.53			3.91	12.43
1992	JP4	21.25	134.90	503.23	29.35	165.73			5.35	858.81
	JP5		5.96	232.95		137.62				376.52
	JP8					4.41			8.29	12.70
1993	JP4		149.70	351.90	90.20	80.29			9.37	681.05
	JP5			266.90		5.02		55.59		327.51
	JP8			53.93		118.41		20.58	20.60	213.51
1994	JP4		72.02	27.17	103.91					203.11
	JP5			125.45				23.48		148.92
	JP8		28.48	302.96		151.15		5.75	43.06	531.40
1995	JP4				61.87			4.89	0.12	66.88
	JP5			10.50				23.07		33.57
	JP8	2.88	126.64	455.41	9.88	239.30		65.12	96.38	995.60
1996	JP4								0.66	0.66
	JP5			240.39		29.52		70.64	9.74	350.29
	JP8	18.76	182.59	608.81	76.36	412.67	39.86	259.46	150.51	1749.02

As more locations converted from JP4 to JP8, the total volume of JP4 delivered decreased as the total volume of JP8 delivered increased. It is possible to further break down the volumes received by the state in which the refinery is located, by company name, by refinery location or by contract.

Chart 7 provides information on the number of reports received per calendar year per region. This chart represents a more detailed breakdown of Chart 5. It shows, for each region and product grade, how many reports were received for each calendar year.

Chart 7

**Yearly Regional Breakdown by Fuel of Reports Received**

Year	Fuel	Region								Total
		1	2	3	4	5	6	7	8	
1990	JP4		3	27	33	28			8	99
	JP5			6		26				32
	JP8					7				7
1991	JP4	36	166	409	93	96			43	843
	JP5		9	145		100				254
	JP8					14			3	17
1992	JP4	17	107	354	78	100			4	660
	JP5		8	105		79				192
	JP8					7			18	25
1993	JP4		84	404	194	85			6	773
	JP5			121	1	3		9		135
	JP8			69		66		11	11	157
1994	JP4		52	18	204					274
	JP5			49				7		56
	JP8		20	281		88		3	31	423
1995	JP4				134			1	3	138
	JP5			24				8		31
	JP8	30	83	326	16	154		21	115	745
1996	JP4								2	2
	JP5			98		9		22	2	131
	JP8	61	120	366	81	217	8	106	140	1099

Chart 7 can be used in conjunction with Chart 6 to get an idea of the average parcel size, which can be indicative of which modes of transportation are used. For example, for Region 6 for JP8 in 1996, 8 tenders were reported representing 39.86 million gallons, which means that each tender represented just under 5.0 million gallons, or the parcel size of a tanker. Reported for Region 4 in 1992 were 78 tenders representing 29.35 million gallons of JP4, or an average parcel size of 0.376 million gallons or 376,000 USG. This could represent mainly truck shipments mixed in with some pipeline shipments of JP4 during this time frame for Region 4.

## **Product Specifications**

During the time frame covered by this report, there were 4 revisions to specification MIL-T-5624 and 2 revisions to MIL-T-83133 used to procure product. Fortunately, there were not many changes to specification parameters caused by these revisions. Any specification change are noted in the series of charts, for year and region, specific for each test property and fuel, which appear in the Appendix section of this report. As the US military purchased only Military specification products by contract, the trends reflected in this report might not necessarily mirror those seen in the commercial petroleum industry. For example, the military specifications generally have a storage stability requirement which the commercial industry does not have, thus the refining techniques may differ in some respects to produce product meeting the storage stability requirement. The two fuels may have slightly different physical and chemical properties, thus giving differing results. These fuels would be similar, not the same.

For the purposes of this report, only those specification properties, which have measurable and definitive requirements in the specification, are summarized, with the exception of cetane index (report only) and naphthalene content (not required for JP4 and JP5). Those specification properties, which involve an assigned rating (e.g., water reaction, JFTOT, and copper corrosion), are not summarized in this report to conserve space. However, data is available for the specification properties not reported by request from the Point-of-Contact (POC) provided in **Section III**. Histograms in **Section II** represent the volumes of property values over all years and regions. The Tables in the **Appendix** show minimum, maximum, average, and weighted average property values according to year and region for each property of each fuel.

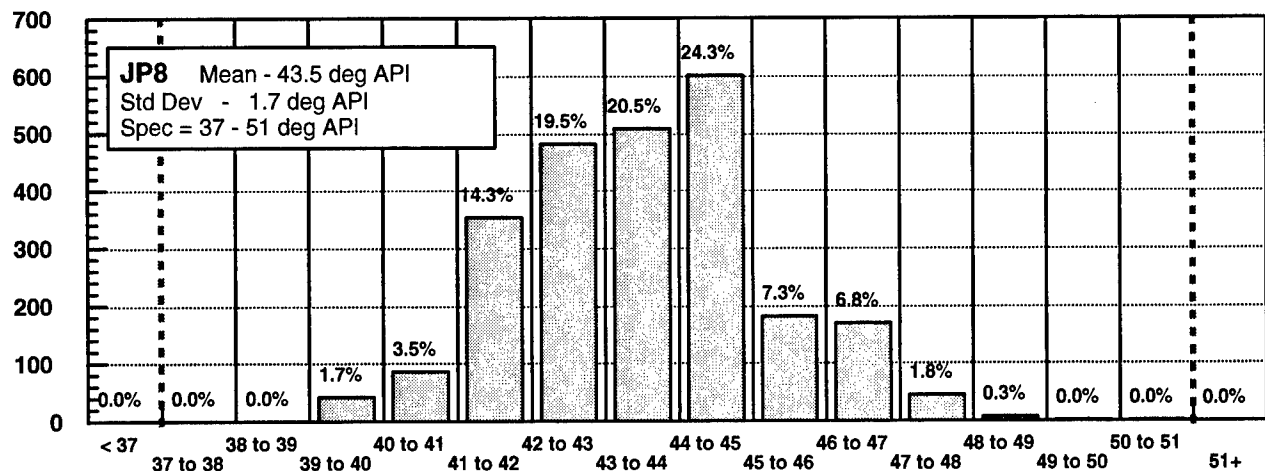
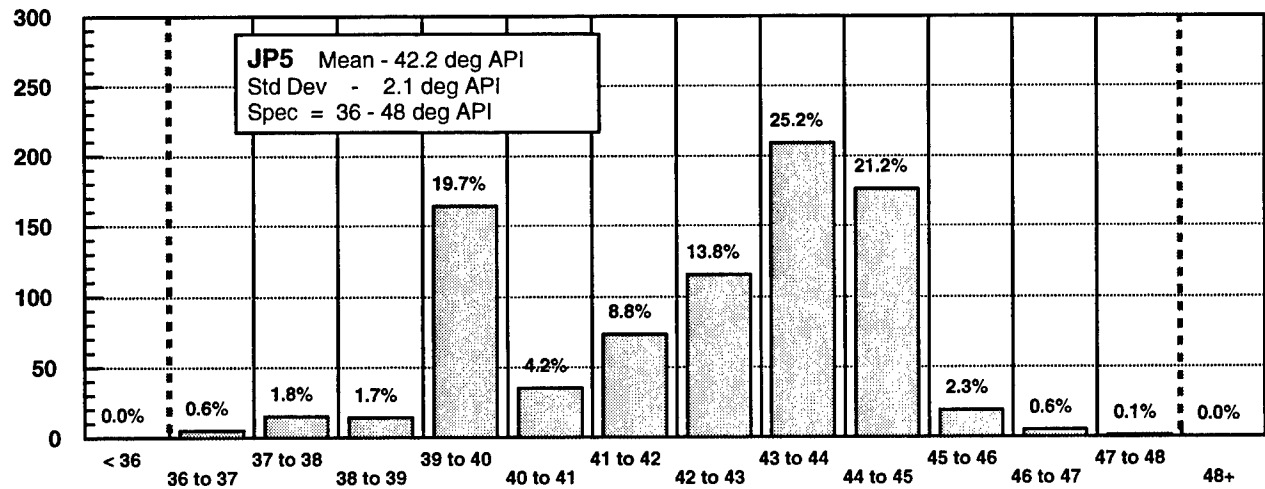
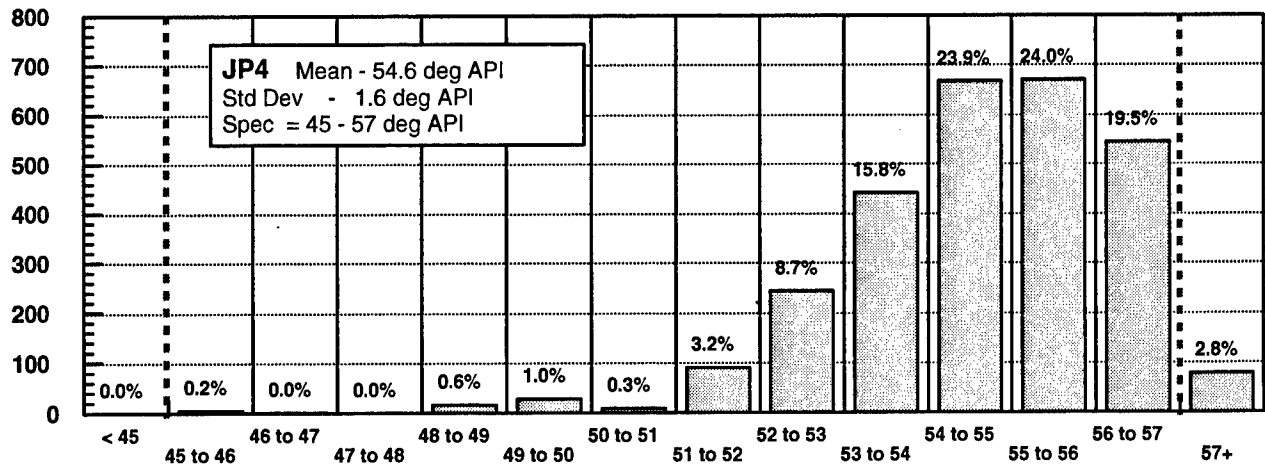
Not all tests were performed on all batches. For *Net Heat of Combustion*, contractors have a choice of two or three different units of measurement, depending on the product, for reporting the net heat or energy content. Contractors also have the option of performing the *Doctor Test* in lieu of *Mercaptan Sulfur*. If the *Doctor Test* is negative, the *Mercaptan Sulfur* need not be performed. Some contractors elected to report both the *Doctor Test* and *Mercaptan Sulfur*. If the *Smoke Point* was below 25 mm, the product was still acceptable as long as the *Naphthalene Content* was below 3.0% and the *Smoke Point* was above the minimum of 19 mm. Specification limits are provided on all charts. For all Tables, the specification values and any changes to them are indicated.

### **Section III - Histogram Charts**

Created in Harvard Chart XL, each histogram shows, for each product and fuel characteristic, the percent by volume of product refined for delivery to the US Government over the entire six years of data for all locations worldwide. The grade of fuel and specification value is indicated in the block within the chart, along with the mean and standard deviation values. Harvard Chart XL automatically calculated the mean and standard deviation. The percentages above the bar represents the percent of total volume of data falling within the data ranges indicated on the x-axis. Heavy dashed lines in the graph represent specification values. To insure all data is included, the first and last bars, where appropriate, have an allowance for data outside of the ranges upon which the histograms are based. A "<[low value]" indicates all occurrences of volumes less than lower range [low value] and a "[high value]+" indicates all occurrences of volumes greater than the upper range [high value]. All six years of data are included to provide the maximum number of data points for use in the charts.

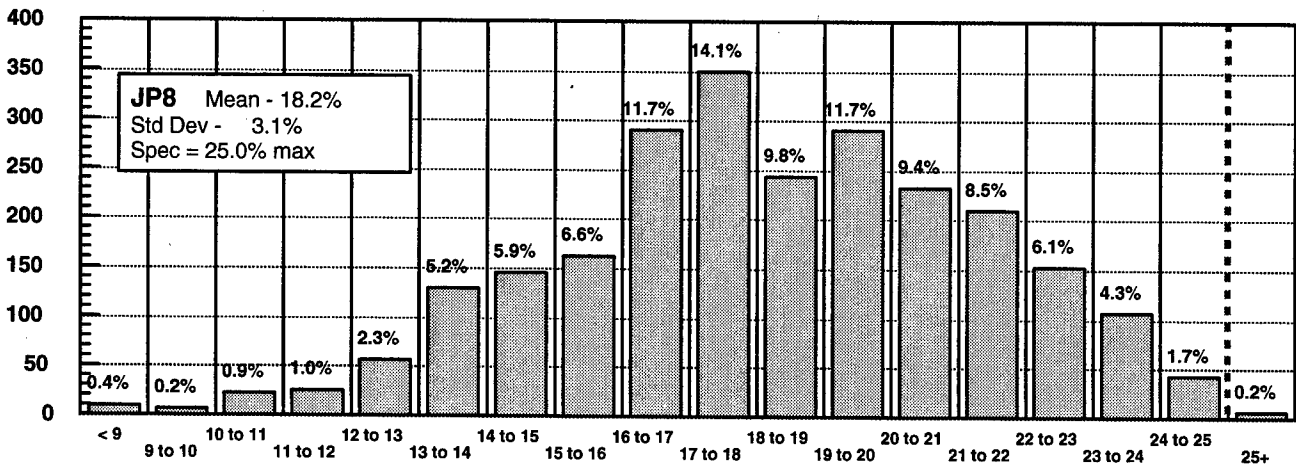
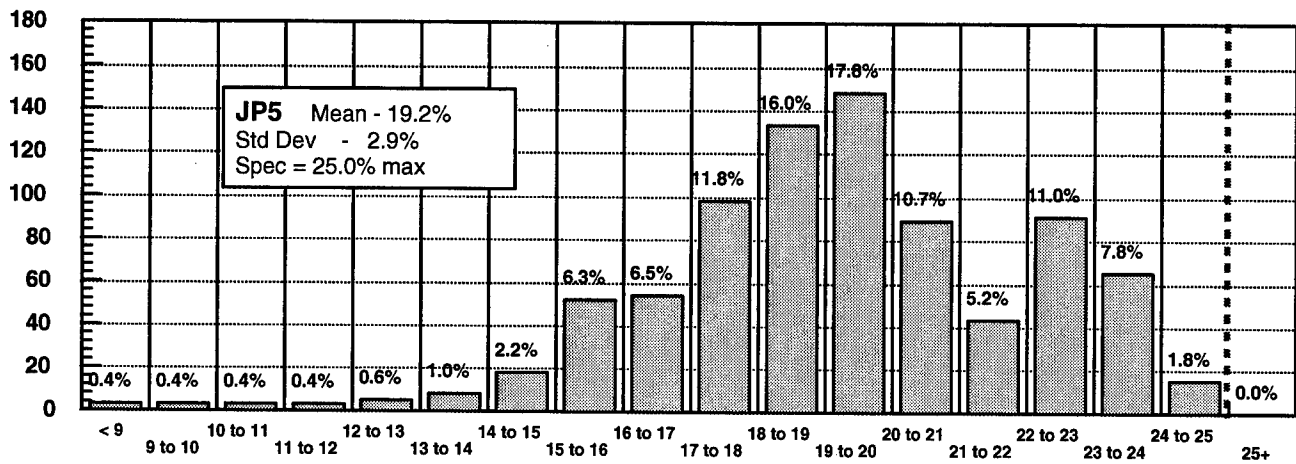
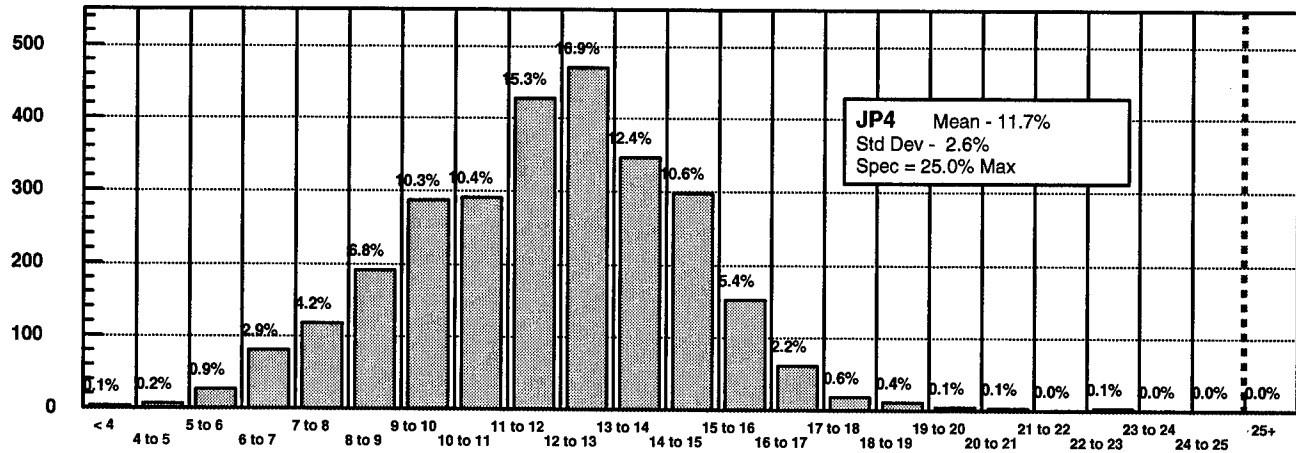
The data indicates the overall distribution of test results on a worldwide basis for the past six years. For some physical and chemical characteristics, more than one method is authorized by the specification. No attempt was made to separate results by the test method used where more than one method was possible, although this also can be done if requested.

Chart 8  
Distribution of API Gravity by Volume Received  
(Millions of Gallons)



NATO/CEPS JA1 - "The mean was 799 kg/m<sup>3</sup>" (45.5° API).

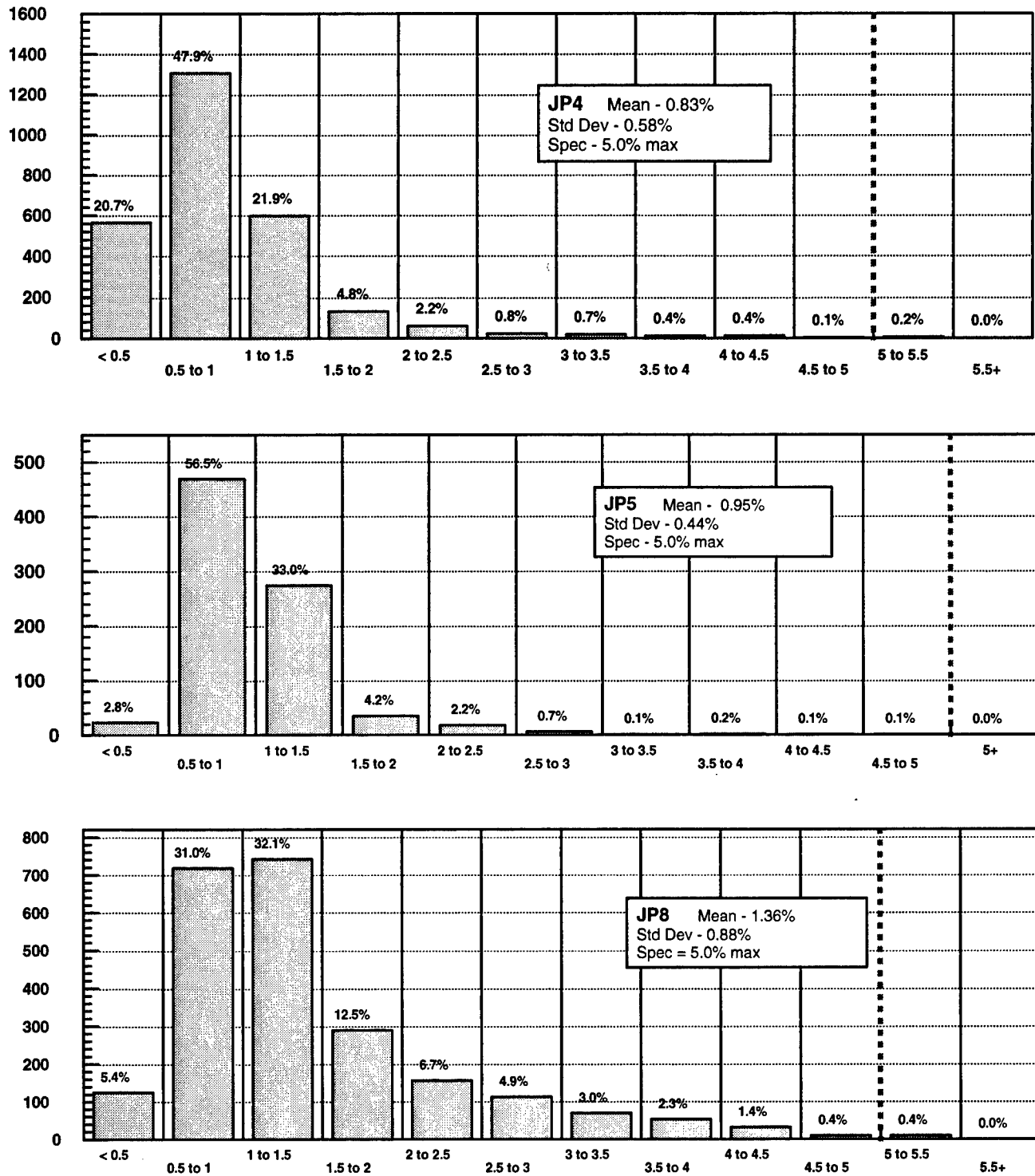
**Chart 9**  
**Distribution of Aromatics by Volume Received**  
(Millions of Gallons)



NATO/CEPS JA1 - "The mean was 18.2% vice the specification limit of 22% (or 25% when hydrogen was reported). There were 19 batches greater than 22%. There were two batches at 24%, which were the highest reported values."

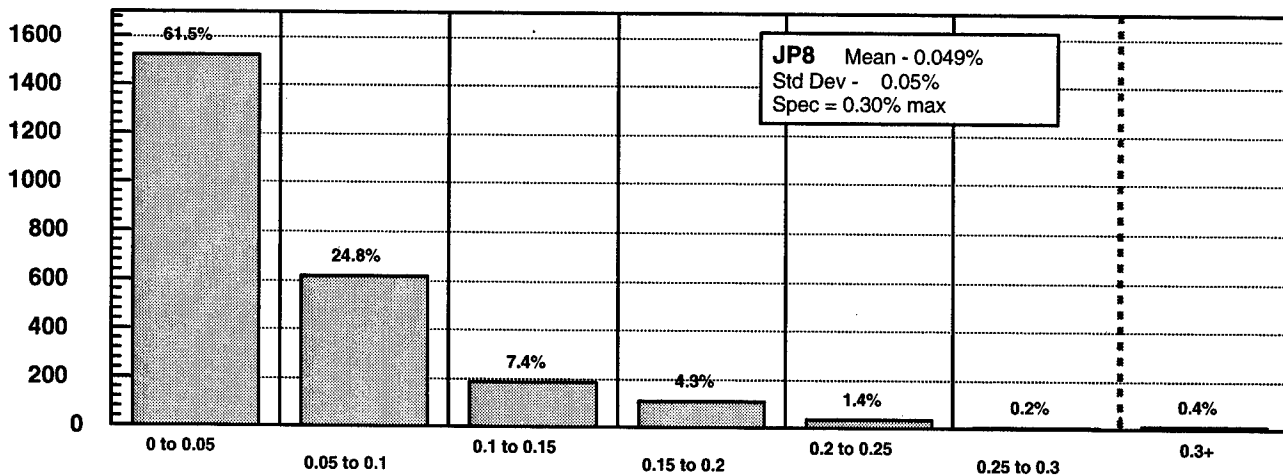
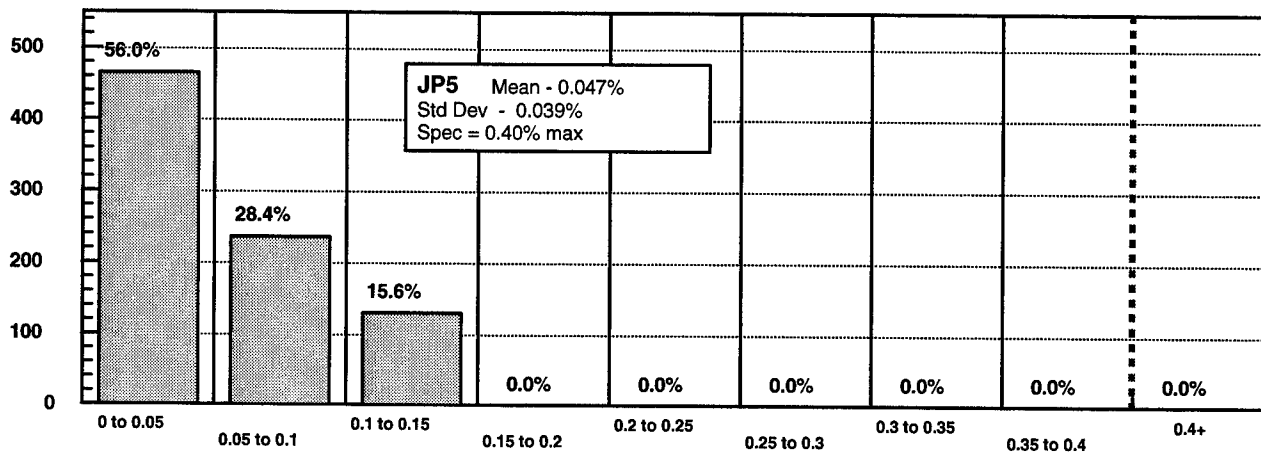
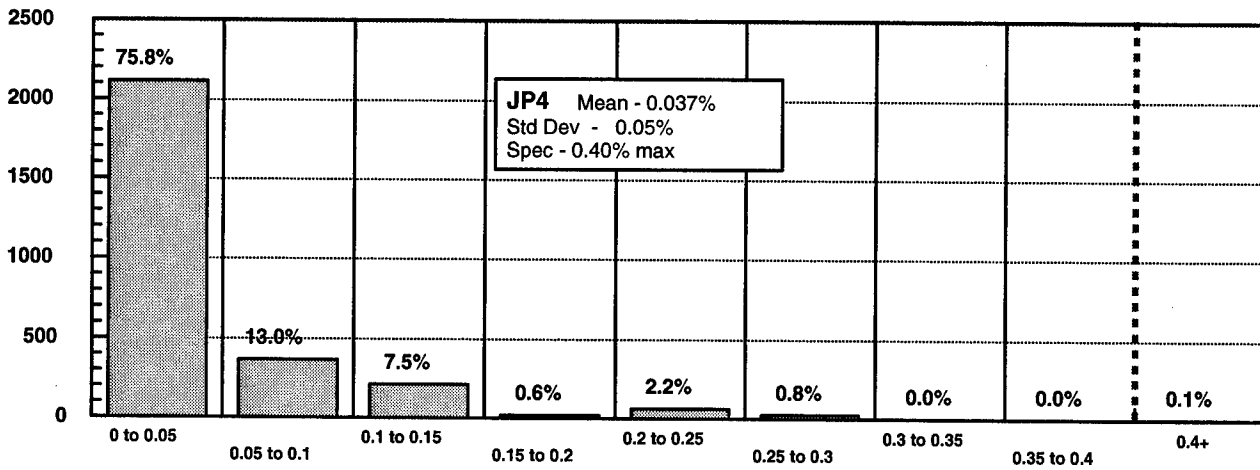


**Chart 10**  
**Distribution of Olefins by Volume Received**  
(Millions of Gallons)



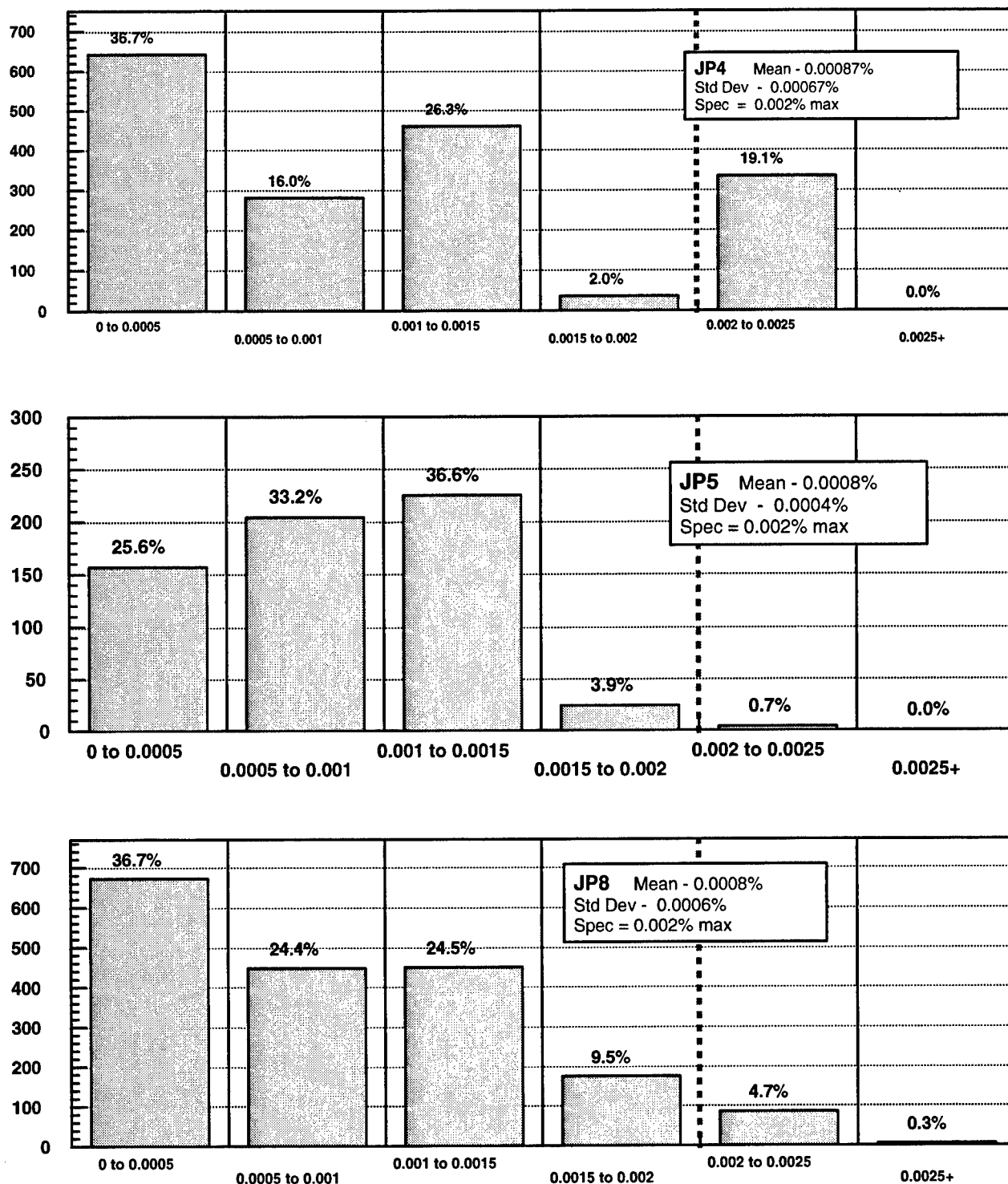
NATO/CEPS JA1 - "The mean of 0.8% is well below the maximum value of 5.0%. Only 9 values were reported greater than 3%, with the highest value equal to 4.7%."

Chart 11  
Distribution of Total Sulfur by Volume Received  
(Millions of Gallons)



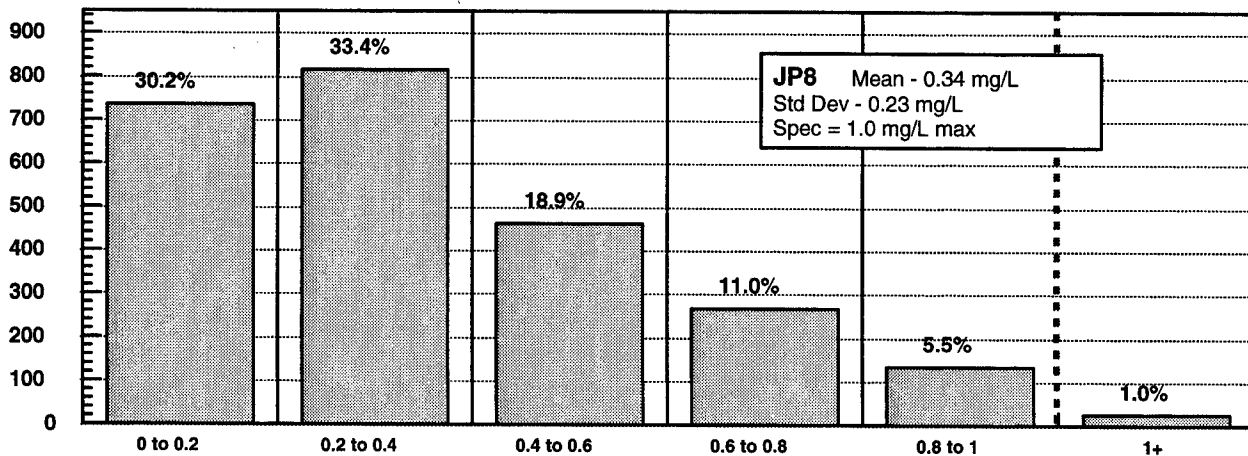
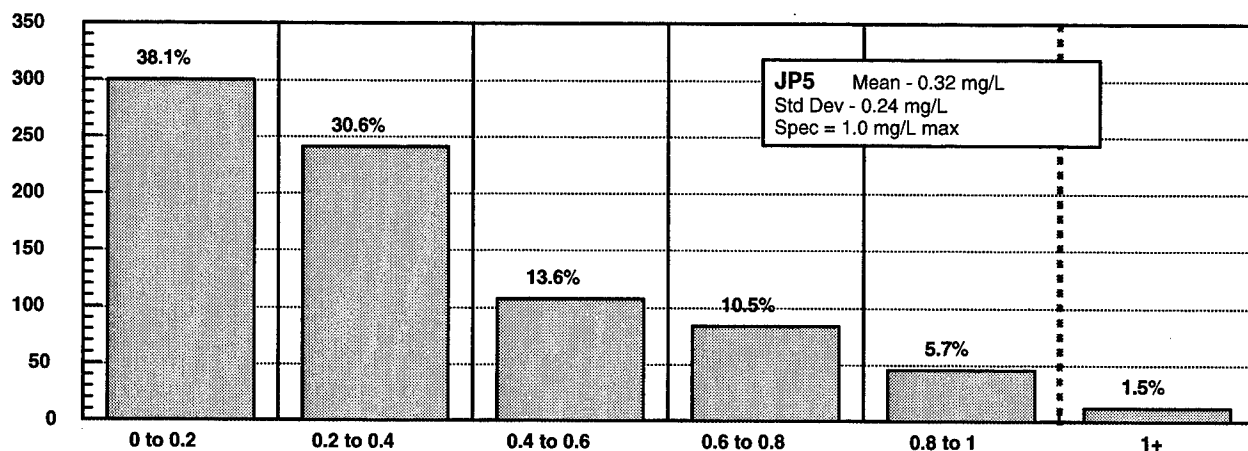
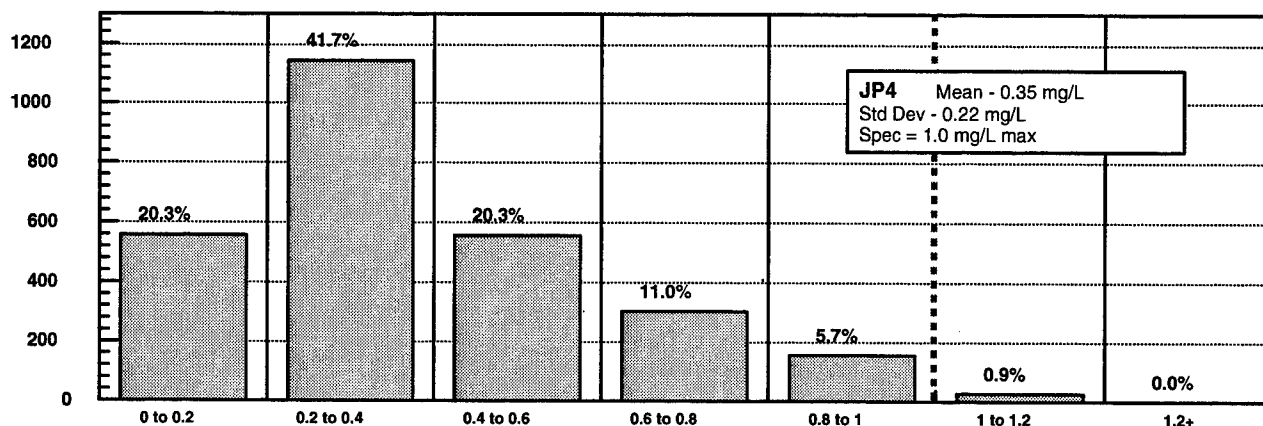
NATO/CEPS JA1 - "The mean of 0.06% is comfortably below the specification limit of 0.3. However, there were 89 batches that exceeded 0.20%. The highest reported value was 0.26%".

Chart 12  
**Distribution of Mercaptan Sulfur by Volume Received**  
 (Millions of Gallons)



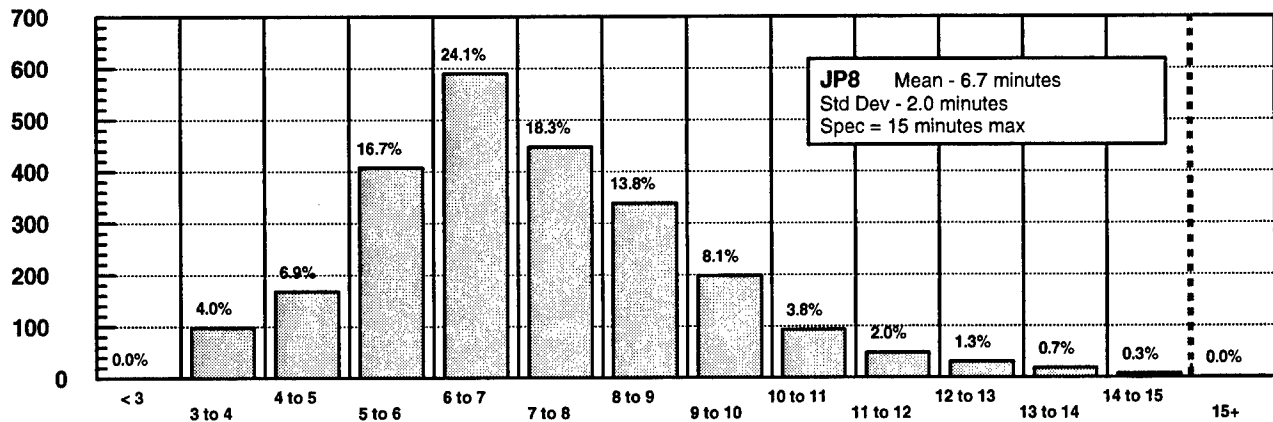
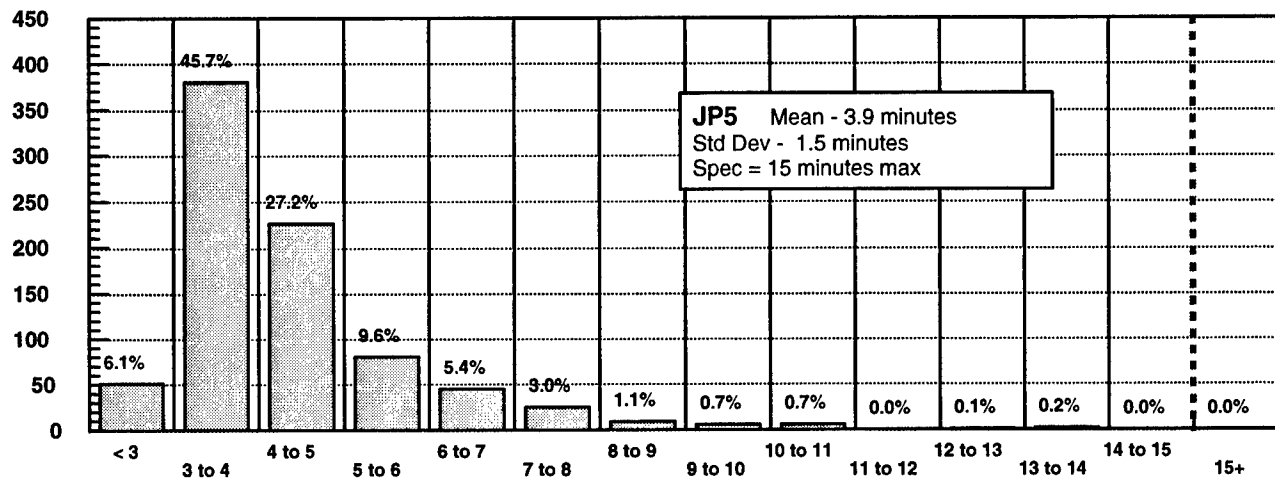
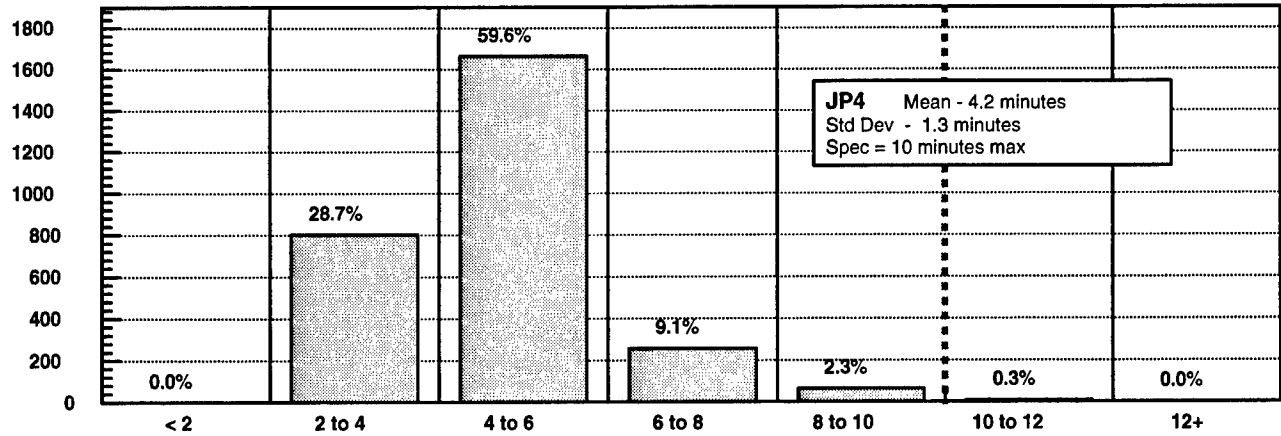
NATO/CEPS JA1 - The mean was 0.0008% mass compared to a maximum limit of 0.003%. There were 64 values at the limit from one source.

Chart 13  
**Distribution of Particulate Contamination by Volume Received**  
 (Millions of Gallons)



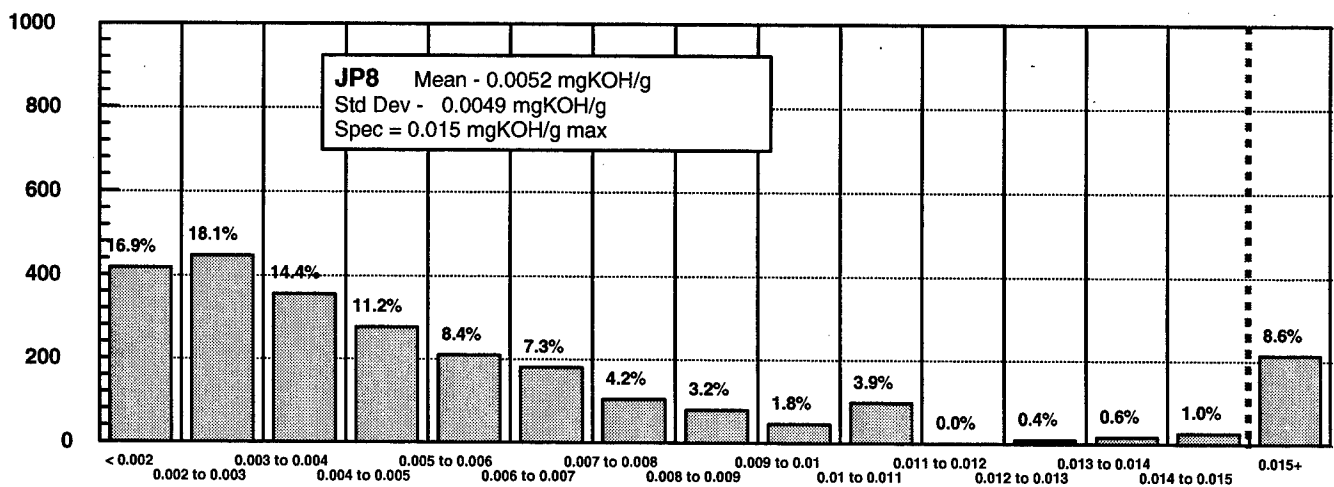
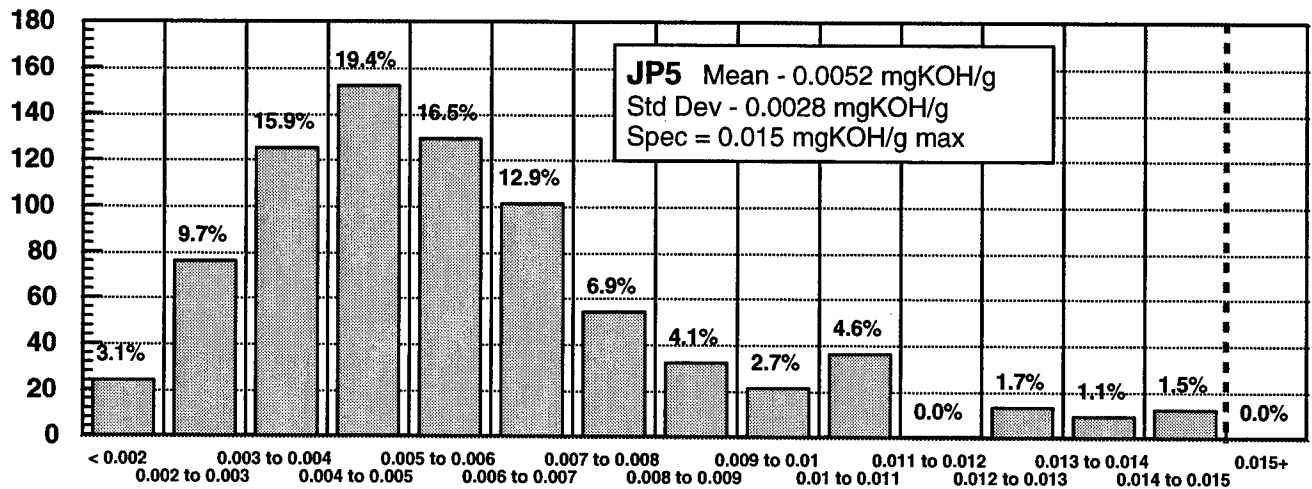
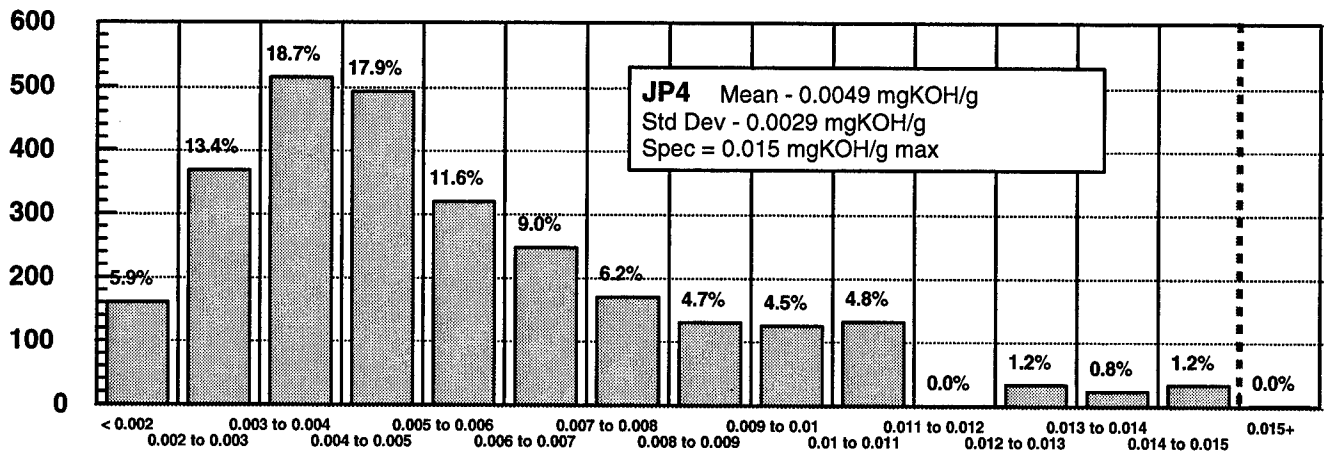
NATO/CEPS JA1 data not reported. Not a specification requirement

**Chart 14**  
**Distribution of Filtration Time by Volume Received**  
(Millions of Gallons)



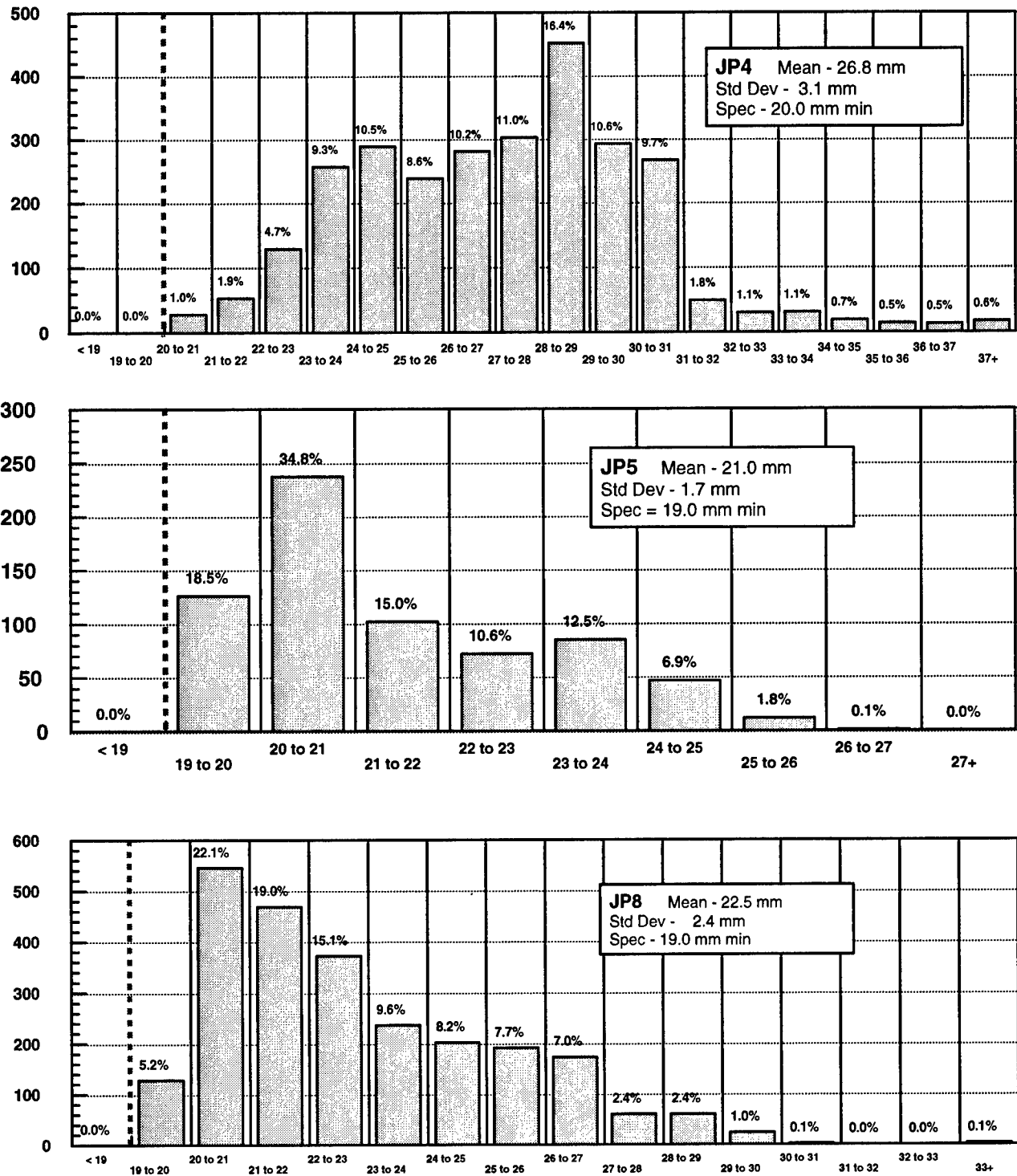
NATO/CEPS JA1 data not reported. Not a specification requirement.

Chart 15  
Distribution of Total Acid Number by Volume Received  
(Millions of Gallons)



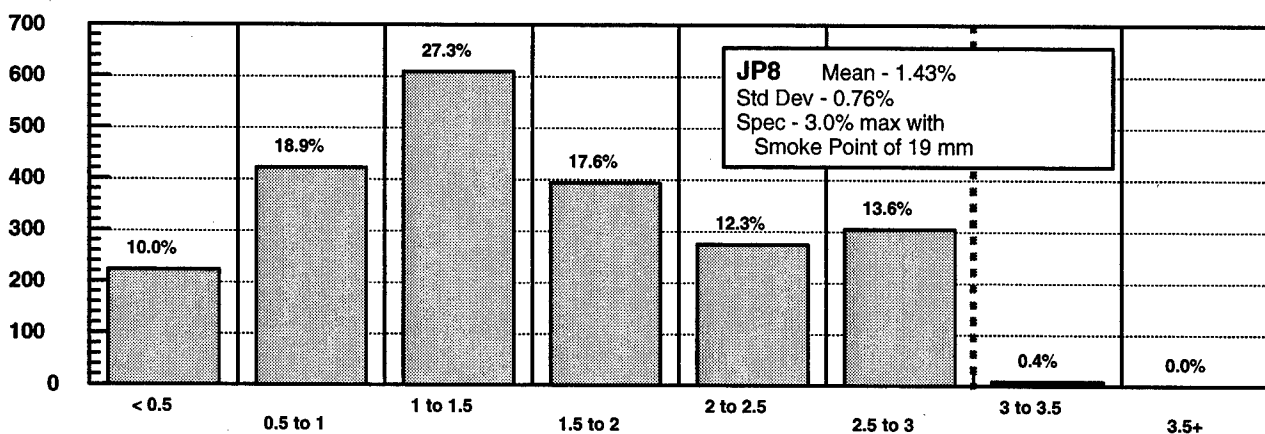
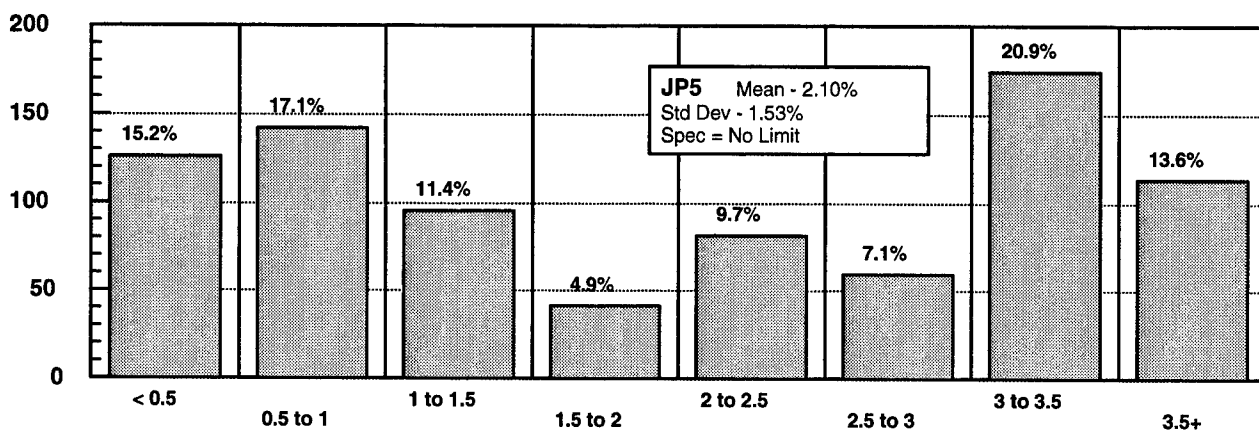
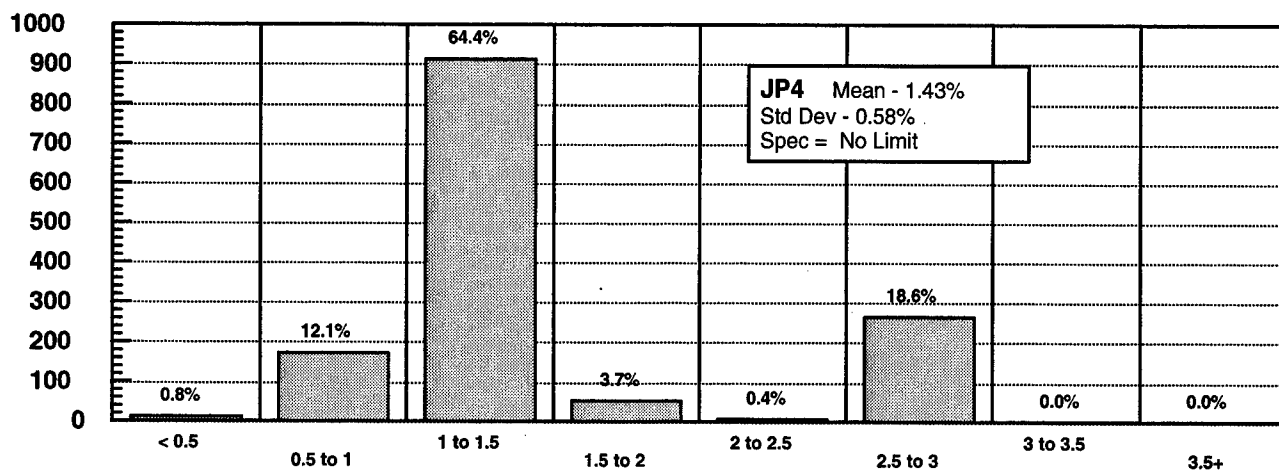
NATO/CEPS JA1 - "The mean value of 0.003 mgKOH/g is well below the specification limit with only one batch reported at the maximum allowable value of 0.015."

**Chart 16**  
**Distribution of Smoke Point by Volume Received**  
(Millions of Gallons)



NATO/CEPS JA1 - "The mean was 24 mm with a minimum specification value of 25 mm. Values are permitted as low as 19 mm when the naphthalene content is not greater than 3.0%. There were 16 batches reporting values at 19 mm. All naphthalene values were less than 3.0%."

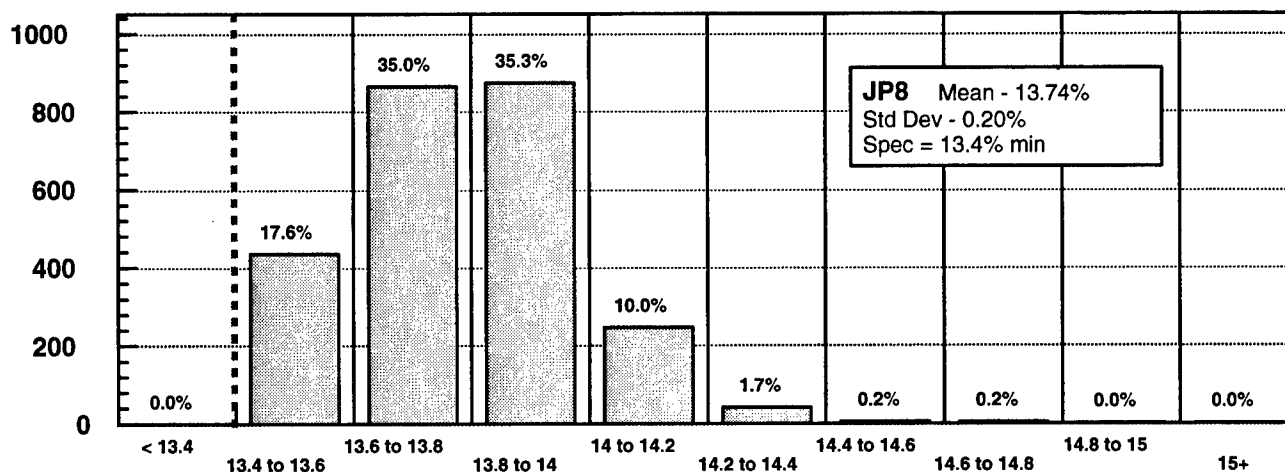
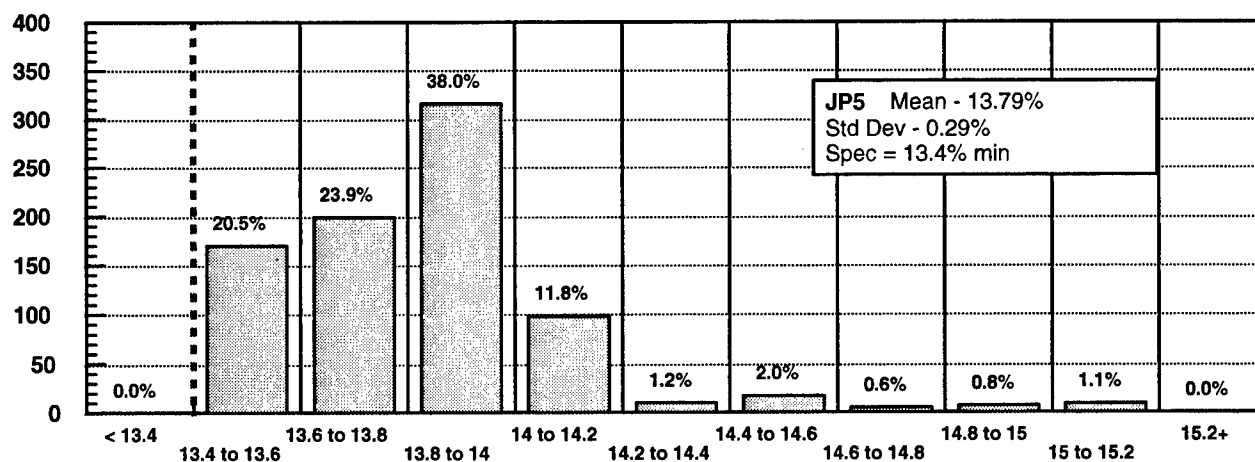
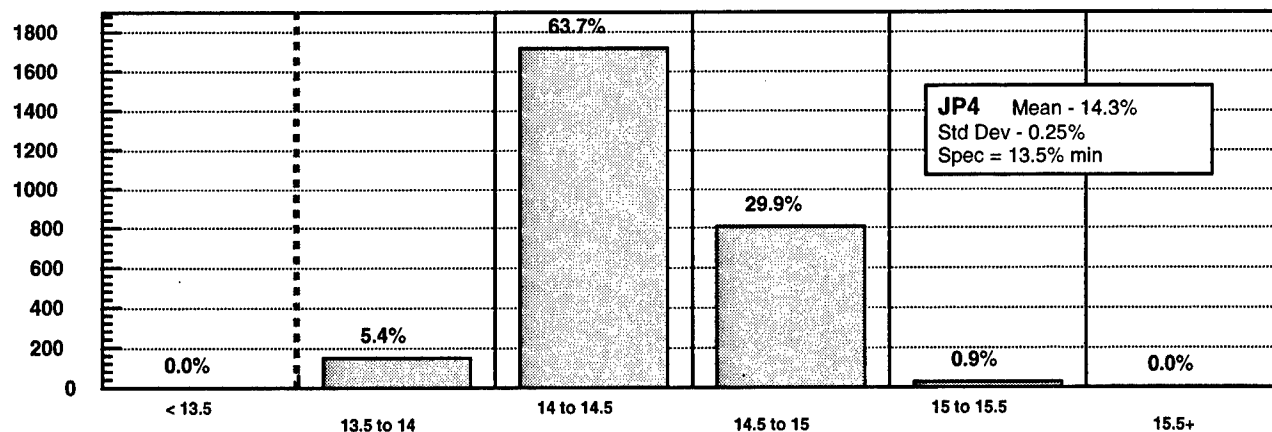
Chart 17  
**Distribution of Naphthalenes by Volume Received**  
 (Millions of Gallons)



NATO/CEPS JA1 - "There were 940 batches that provided the naphthalene content. The mean was 1.2%, and the 4 maximum values were at 2.70%."

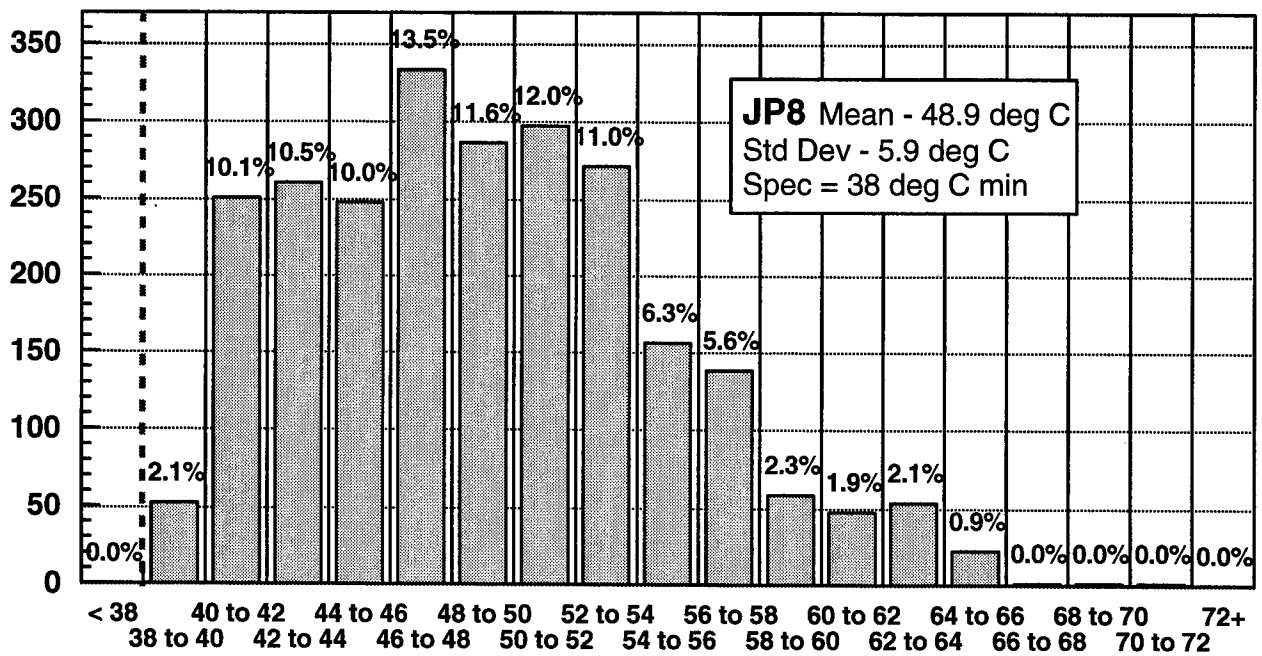
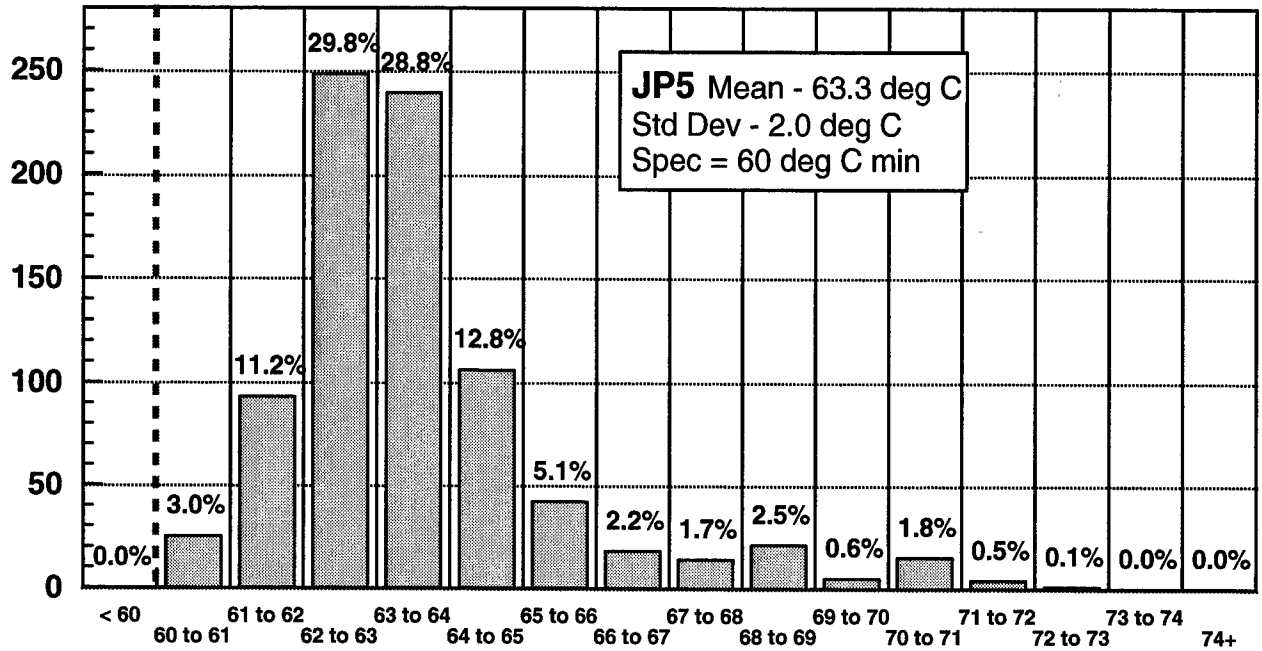


Chart 18  
Distribution of Hydrogen Content by Volume Received  
(Millions of Gallons)



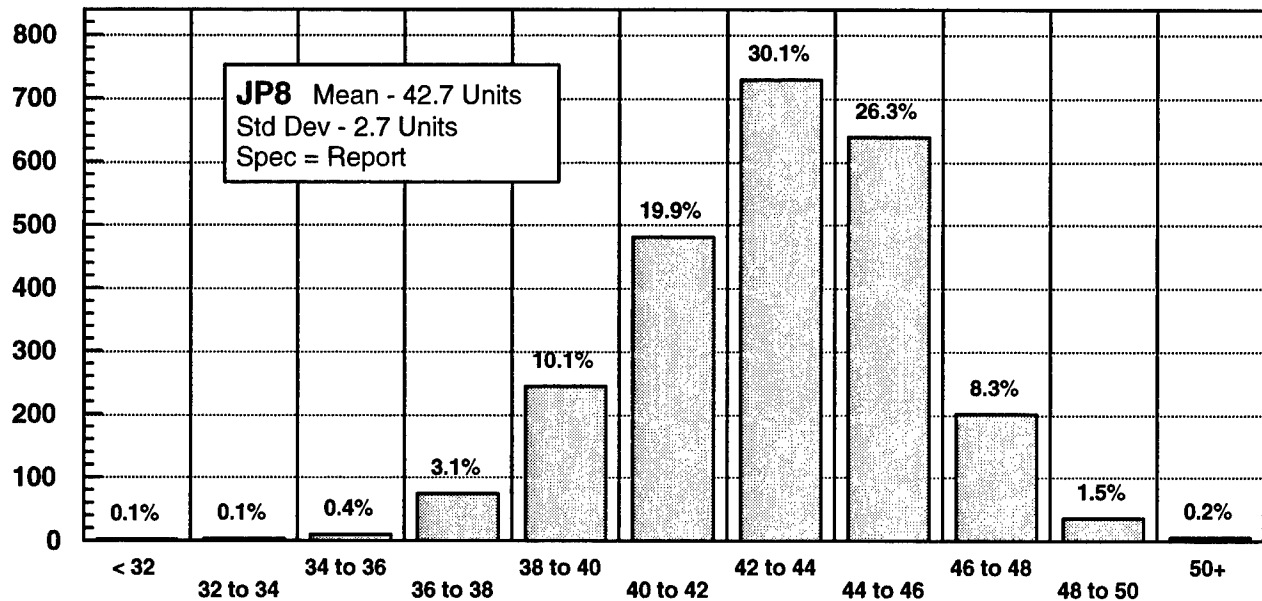
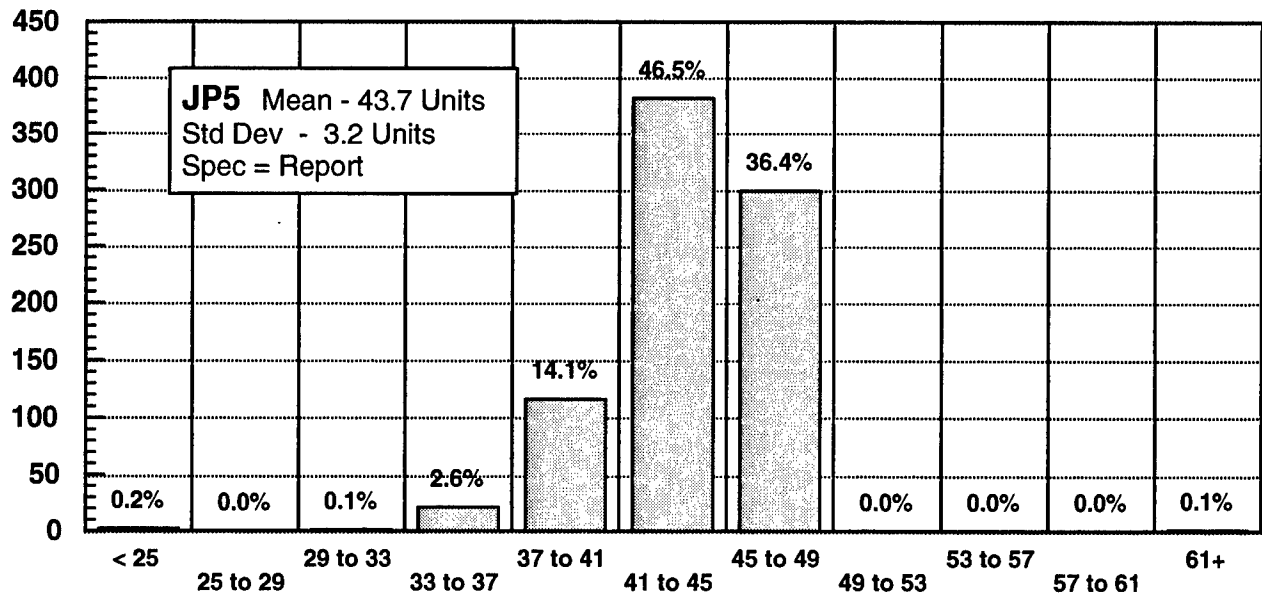
NATO/CEPS JA1 - "The values for 931 batches were reported with a mean of 13.7 percent mass."

Chart 19  
Distribution of Flash Point by Volume Received  
(Millions of Gallons)



NATO/CEPS JA1 - "The mean value was 43.6°C, compared to a minimum specification limit of 38°C. Twenty batches were at the limit of 38°C."

Chart 20  
Distribution of Cetane Index by Volume Received  
(Millions of Gallons)



NATO/CEPS JA1 data not reported. Not a specification requirement.

## **Section IV - Conclusions**

This is the first annual PQIS report to be published since the inception of the database. Many DESC personnel contributed to its development, maintenance and data entry functions. As *Chart 3* shows, with the exception of 1995, PQIS is capturing an increasing percentage of volume purchased for JP8. The percentage is the volumes reported in PQIS compared against the volumes reported in DFAMS, which should represent actual purchase figures for each line item under each contract. This comparison is based on the assumption that DESC would receive copies of DD-250-series documents for all contracts represented by the DFAMS figures. Verifying this assumption would involve reviewing each individual contract in PQIS and DFAMS and verifying quantities received for each calendar year for each of these contracts. If this assumption is false, then 100% total compliance will not be reached, but the compliance rate should be close to 100%. It is essential that PQIS therefore be linked to DFAMS and to the new FAS system in order to make this comparison. For this report, data accumulated through the normal mail-in requirement is published. For the next report, an attempt will be made to complete CY 1996.

For those properties which are directly related to hydrocarbon composition, such as *API Gravity*, *Aromatics*, *Filtration Time*, *Smoke Point*, *Naphthalenes* and *Hydrogen Content*, the shape of the curve created by the bars in the histogram occurs in different data ranges in JP4 than for JP5/JP8. This demonstrates that the type of fuel being produced affects the differences in properties. The properties of *Olefins*, *Total Sulfur*, *Mercaptan Sulfur* and *Acid Number*, are consistent for JP4, JP5 and JP8, thus showing that these properties are controlled by the refining process techniques. Olefins are a side product of the various cracking and reforming reactions used to increase the useable portion of crude oil, and would thus be expected to fall into the latter category.

In the Appendix are Tables, which provide the minimum, average, weighted average and maximum values for a product property by fuel grade, year, and region. These Tables are used as a supplement to the histograms in Section II. This report provided three means for reporting a mid-range test result for each property for each Region and calendar year: the mean, the average and the volumetrically weighted average. Each calculation is based on a different focus, thus producing different results. Analysis of individual properties is provided below.

### **API Gravity**

Data shows that all JP5 and JP8 reported were purchased within the specification range. Of the JP4 purchases, 2.8% of the volume was at the maximum API Gravity of 57.0°API (Table 1), which occurred in regions producing high API Gravity product. Table 3 provides regional values for API Gravity for JP8. The mean value for Region 7 (Europe) compares favorably to the mean for CEPS JA1.

### **Aromatics**

Data shows that all JP4 and JP5 reported were purchased within specification. Of the JP8 purchases, 0.2% of the volume was at the maximum of 25.0%, purchased in Region 5 for 1993. In general, the JP4 curve shifts to lower values than the JP5/JP8, showing JP4 to be less aromatic. Comparing Region 7 (Europe) to information from the CEPS JA1, the means compare favorably.

### **Olefins**

Data shows that all of the JP5 reported was purchased within specification. Of the JP4 and JP8 purchases, over 99% of the purchases were below 5.0%, with 0.7% of the volume at the limit of 5.0%. The mean of 0.8% for CEPS is greater than average of 0.64% for Region 7 (Europe). The CEPS product was spread out over a greater range (0.1 - 4.7%) than for Region 7 in 1996 (0.2 - 1.3%). For JP4 (Table 7), Region 2 had roughly double the olefinic content than either Regions 3 or 4. For JP5 (Table 8), Region 5 has twice as much content than Region 3.

### **Total Sulfur**

Data shows that all of the JP5 reported was purchased within specification. Over 99% of JP4 and JP8 were under the specification limits. For JP4, Region 2 reported values at the limit of 0.40% for 1993. For JP8, Regions 3 and 7 reported values at the limit of 0.30%. The median value for CEPS (0.06%) was lower than for Region 7 (Europe) in 1996 (0.079%).

### **Mercaptan Sulfur**

This test is not required if the Doctor Test is "Negative". The data presented would therefore be a subset of the total data points. For JP4 and JP5, no values were above 0.0020%. For JP8, 4.7% of the volume purchased was between 0.0020% and 0.0025%, with approximately 99% of the values at the limit of 0.0020%. From Table 15, values of JP8 above 0.0020% appear in Region 7 (Europe), with the average values in JP8 for Region 7 increasing over time. The mean of CEPS JA1 (0.0008%) is less than the average for what is purchased for the military in Region 7 for 1996 (0.0013%).

### **Particulate Contamination**

Data shows that the mean values for JP4, JP5 and JP8 were about the same with similar standard deviations. About 60% of the volume purchased had a particulate contamination below 0.4%. Using the JP8 mean of 0.34%, the US Government purchased 2.99 million grams (6,578 pounds) of sediment on average from reported shipment during 1990 - 1996.

### **Filtration Time**

Data shows that all JP5 and JP8 were purchased within the specification limits for filtration time. For JP4 (Table 19), there was one instance of a filtration time of 13 minutes accepted by DESC waiver representing a volume percentage so small that the bar did not show up on the graph. Other values within the range of 10 - 12 were at the maximum of 10 minutes.

### **Total Acid Number**

Data shows that all of the JP4 and JP5 were purchased within the specification limits for total acid number. For JP8 (Table 24), acid number which exceeded the specification were reported from Region 8 for all years. The mean acid numbers for all three products are similar. For CEPS JA1, the mean of 0.003 mgKOH/g is less than the average for Region 7 in 1996 (0.0052%).

### **Smoke Point**

Data shows that all product purchased was within the specification limit for smoke point. The JP8 specification allows a reduction from 25-mm minimum to 19-mm minimum for fuel having a naphthalene content of 3.0% maximum. About 66% of the JP8 purchased were between 19 - 25 range. The CEPS JA1 mean of 24 mm compares favorably with the Region 7 1996 average of 25.3 mm.

### **Naphthalenes**

Naphthalenes are reported for JP8 only when the smoke point is below 25 mm. Graphs in Chart 17 show all fuel shipments for which naphthalenes were reported. Only the JP8 values for region and year are detailed. Table 28 shows that all JP8 was purchased within the specification limits.

### **Hydrogen Content**

Data shows that all products were purchased within the specification range for hydrogen content. The mean values for JP4 (14.3%), JP5 (13.8%) and JP8 (13.7%), with JP5 and JP8 close. Since JP4 has a lower aromatic content, JP4 would be expected to have a higher hydrogen content, since the lower aromatic content would mean a higher percentage of saturated hydrocarbons.

### **Distillation**

Distillation results were reported from Table 32 - Table 38 for those distillation requirements, which have a limiting value. No obvious trends are apparent.

### **Flash Point**

The flash point is required only for JP5 and JP8. Data shows all product purchased within specification limits. The mean flash point for JP5 was 63.3°C and was 48.9°C for JP8. Flash Point for JP5 did not exceed 72°C. For JP8 (Table 40), Region 5 in 1992 seemed to have used the same product for JP5 and JP8.

### **Cetane Index**

The cetane index is a report only requirement. The JP5 mean is 43.7 and the JP8 mean is 42.7. The JP8 is more tightly centered on the mean than the JP5 with most of the data falling between a cetane index of 37 to 49.

### **Net Heat of Combustion**

The Net Heat can be reported in three different ways: the Aniline-API Gravity product or net heat reported in either British Thermal Units (BTUs) or in MilliJoules per kg (MJ/kg). Heat Contents are generally higher in JP4 than in either JP5.

## **Appendix - Tables of Property Values**

The following tables are designed to show the minimum, average, volumetrically weighted average and maximum values for each fuel property of the specified grade of fuel. The values are broken down by year and by region. Also supplied for each year and region combination is the volume, in millions of gallons, represented by the data as well as the number of reports that contained data in the field. These charts are designed to be “stand alone”, with all the information contained within each chart to allow it to be separated from the main body of the report and still be useable.

Please note that, as discussed in ***Section I - Specifications***, not all properties are required to be checked if alternatives exists to evaluate the characteristic desired.

Using these charts, it is possible to compare averages from different regions. For example, if a researcher desires a comparison in average API gravity of JP4, the researcher will go to Table 1 - “Values of JP4 for API Gravity by Region” (on the following page) and observe the values for Region 1 (East Coast) and compare those with Region V (West Coast). The researcher would find that the fuel supplied in Region V trends to be lower in API Gravity that the fuel supplied in Region 1. The researcher would then evaluate the significance, if any, of this observation.

In order to accurately assess contractor compliance, the volume of fuel delivered must be known precisely so that the quantity delivered as reported by DFAMS / FAS is comparable to the volume in PQIS. These quantities may not match exactly, since corrections to the DD-250-series documents sometimes involves a quantity shipped correction and may not be adjusted in the PQIS database. A good link must therefore be set between PQIS and FAS to enable quantity comparisons and thereby giving an indication of contractor compliance.



*Table 1*

**Values of JP4 for API Gravity by Region**

(Volume in Millions of Gallons)

(Spec = 45 - 57 ° API)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	52.0	53.5	54.8	56.5	3
1990	3	JP4	14.4	52.3	55.7	55.8	56.9	27
1990	4	JP4	28.1	54.2	55.3	55.4	57.0	33
1990	5	JP4	53.3	50.8	54.0	54.6	55.7	28
1990	8	JP4	11.2	55.1	55.9	55.8	56.5	8
1991	1	JP4	46.4	54.2	56.0	56.1	56.7	36
1991	2	JP4	200.0	51.1	53.8	53.8	56.5	166
1991	3	JP4	803.8	51.0	55.0	55.5	57.0	409
1991	4	JP4	55.0	53.3	54.8	54.7	56.8	93
1991	5	JP4	190.4	48.7	53.5	53.7	56.0	96
1991	8	JP4	59.5	54.1	56.2	56.3	56.8	43
1992	1	JP4	21.2	55.8	56.6	56.6	57.0	17
1992	2	JP4	134.9	51.1	54.2	54.5	56.8	107
1992	3	JP4	502.2	50.9	54.5	54.9	57.0	354
1992	4	JP4	29.4	52.2	55.0	55.1	56.7	78
1992	5	JP4	165.7	48.5	57.9	53.7	55.7	100
1992	8	JP4	5.3	49.6	54.0	55.1	56.3	4
1993	2	JP4	149.7	52.7	55.4	54.8	56.8	84
1993	3	JP4	351.5	51.9	54.4	55.0	57.0	404
1993	4	JP4	90.2	51.0	55.3	55.4	56.9	194
1993	5	JP4	80.3	48.6	53.4	54.2	56.2	85
1993	8	JP4	9.4	45.5	45.5	45.5	41.2	6
1994	2	JP4	72.0	53.0	55.7	55.4	56.8	52
1994	3	JP4	27.2	53.2	54.7	55.2	56.9	18
1994	4	JP4	103.9	52.7	55.0	55.0	57.0	204
1995	4	JP4	61.9	52.6	54.5	54.5	56.7	134
1995	7	JP4	4.9	56.3	56.3	56.3	56.3	1
1995	8	JP4	0.1	53.3	54.1	53.6	55.1	3
1996	8	JP4	0.7	53.2	53.4	53.3	53.6	2

Table 2

**Values of JP5 for API Gravity by Region**

(Volume in Millions of Gallons)

(Spec = 36 - 48° API)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	41.1	41.8	41.8	42.4	6
1990	5	JP5	32.8	39.1	39.4	39.4	41.3	26
1991	2	JP5	5.9	43.7	43.9	43.9	44.2	9
1991	3	JP5	298.5	40.2	43.2	42.9	45.3	145
1991	5	JP5	159.0	36.6	39.2	39.1	40.4	100
1992	2	JP5	6.0	42.5	43.4	43.4	43.9	8
1992	3	JP5	232.9	40.7	42.6	42.3	45.1	105
1992	5	JP5	137.6	38.8	39.7	39.7	42.4	79
1993	3	JP5	266.9	40.7	43.8	43.8	46.8	123
1993	5	JP5	5.0	37.2	37.7	37.4	38.1	3
1993	7	JP5	55.6	40.0	42.0	41.8	45.4	9
1994	3	JP5	125.4	40.3	42.7	42.7	44.6	49
1994	7	JP5	23.5	41.5	43.0	43.1	45.8	7
1995	3	JP5	10.5	37.1	42.8	38.7	44.2	23
1995	7	JP5	23.1	40.8	43.4	42.9	46.5	8
1996	3	JP5	240.4	37.2	43.6	43.6	47.8	98
1996	5	JP5	29.5	39.3	40.0	40.4	41.6	9
1996	7	JP5	70.6	41.2	43.9	43.9	46.8	22
1996	8	JP5	9.7	44.3	44.6	44.6	45.0	2

**Table 3**

***Values of JP8 for API Gravity by Region***

(Volume in Millions of Gallons)  
(Spec = 37.0 - 51.0° API)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	39.1	39.7	39.7	41.3	7
1991	5	JP8	8.5	39.0	39.4	39.4	39.9	14
1991	8	JP8	3.9	42.7	43.7	43.7	45.2	3
1992	5	JP8	4.4	39.1	39.6	39.6	40.2	7
1992	8	JP8	8.3	43.1	43.5	43.4	43.9	18
1993	3	JP8	53.9	42.1	43.9	43.4	45.0	69
1993	5	JP8	118.4	41.1	41.9	42.0	43.3	66
1993	7	JP8	20.6	42.8	44.8	45.1	46.2	11
1993	8	JP8	20.6	43.0	44.1	44.5	47.0	11
1994	2	JP8	28.5	42.6	44.1	44.2	44.9	20
1994	3	JP8	303.0	39.8	43.7	43.7	47.4	281
1994	5	JP8	151.1	40.6	41.7	41.8	43.6	88
1994	7	JP8	5.7	46.4	46.9	47.0	47.6	3
1994	8	JP8	43.1	40.5	42.8	42.8	45.3	31
1995	1	JP8	2.9	40.9	42.8	42.9	44.7	30
1995	2	JP8	126.6	42.2	44.2	44.3	45.0	83
1995	3	JP8	455.4	41.0	44.2	44.4	48.7	325
1995	4	JP8	9.9	42.8	44.8	44.7	46.8	16
1995	5	JP8	239.3	39.7	41.8	42.0	44.1	154
1995	7	JP8	65.1	41.8	45.3	45.3	48.0	21
1995	8	JP8	96.4	41.9	43.0	43.1	46.1	115
1996	1	JP8	18.8	41.2	42.9	44.1	45.3	61
1996	2	JP8	182.6	41.4	44.3	44.2	46.0	120
1996	3	JP8	608.8	40.5	44.1	43.9	48.2	366
1996	4	JP8	76.4	42.4	45.3	45.2	47.2	81
1996	5	JP8	412.7	39.1	41.4	41.8	45.7	217
1996	6	JP8	39.9	45.6	46.1	46.1	46.3	8
1996	7	JP8	259.5	40.8	45.0	45.4	48.1	106
1996	8	JP8	150.5	42.0	43.9	45.7	50.1	140

NATO/CEPS JA1 Min/Max: "778 - 824 kg/m<sup>3</sup>" (40.1 - 48.0° API). Mean of 45.5° API.

***Table 4***

***Values of JP4 for Aromatics by Region***

(Volume in Millions of Gallons)

(Spec = 25.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	11.4	12.6	13.5	14.8	3
1990	3	JP4	14.4	9.4	10.8	12.1	13.7	27
1990	4	JP4	28.1	3.9	10.5	10.9	15.0	33
1990	5	JP4	53.3	6.6	10.8	11.6	13.7	28
1990	8	JP4	11.2	6.6	13.4	14.0	19.7	8
1991	1	JP4	46.4	8.0	11.3	11.4	13.4	36
1991	2	JP4	200.0	5.0	9.7	9.6	15.5	166
1991	3	JP4	803.8	6.3	11.9	12.5	18.3	409
1991	4	JP4	55.0	5.5	10.7	11.1	18.0	93
1991	5	JP4	190.4	5.6	11.6	12.5	15.4	96
1991	8	JP4	59.5	7.1	11.9	12.1	22.6	43
1992	1	JP4	21.2	9.2	10.9	10.9	12.1	17
1992	2	JP4	134.9	4.5	9.4	9.0	13.8	107
1992	3	JP4	502.2	6.0	12.3	12.3	22.7	354
1992	4	JP4	29.4	6.2	11.1	10.1	15.3	78
1992	5	JP4	165.7	5.2	12.6	13.3	16.9	100
1992	8	JP4	5.3	10.1	11.9	11.5	13.6	4
1993	2	JP4	149.7	7.5	11.1	11.1	13.9	84
1993	3	JP4	351.5	5.2	12.6	12.3	19.3	404
1993	4	JP4	90.2	3.5	11.4	10.1	16.8	194
1993	5	JP4	80.3	8.9	12.2	12.4	15.3	85
1993	8	JP4	9.4	13.0	15.8	15.8	18.0	6
1994	2	JP4	72.0	9.0	11.7	10.9	14.8	52
1994	3	JP4	27.2	8.0	11.9	12.3	14.8	18
1994	4	JP4	103.9	3.0	11.4	11.1	18.0	204
1995	4	JP4	61.9	8.6	12.7	12.8	20.1	134
1995	7	JP4	4.9	13.6	13.6	13.6	13.6	1
1995	8	JP4	0.1	8.6	9.6	10.1	10.3	3
1996	8	JP4	0.7	12.5	12.7	12.8	12.9	2

**Table 5**

***Values of JP5 for Aromatics by Region***

(Volume in Millions of Gallons)

(Spec = 25.0% max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	21.0	22.8	22.7	24.5	6
1990	5	JP5	32.8	19.2	22.4	22.5	23.8	26
1991	2	JP5	5.9	14.0	15.3	15.4	16.0	9
1991	3	JP5	298.5	11.5	17.7	18.3	22.4	145
1991	5	JP5	159.0	8.4	21.5	21.4	24.4	100
1992	2	JP5	6.0	14.0	15.6	15.6	17.0	8
1992	3	JP5	232.9	13.0	18.4	19.2	21.7	105
1992	5	JP5	137.6	20.6	22.7	22.7	24.7	79
1993	3	JP5	266.9	13.4	18.1	18.4	21.1	123
1993	5	JP5	5.0	11.7	12.0	11.8	12.2	3
1993	7	JP5	55.6	17.3	19.2	19.0	20.4	9
1994	3	JP5	125.4	0.9	18.8	19.3	21.2	49
1994	7	JP5	23.5	17.0	18.7	18.4	20.4	7
1995	3	JP5	10.5	11.5	17.6	15.6	20.2	23
1995	7	JP5	23.1	19.0	20.1	20.1	21.0	8
1996	3	JP5	240.4	12.8	18.5	18.6	23.6	98
1996	5	JP5	29.5	19.6	20.4	20.6	22.9	9
1996	7	JP5	70.6	15.6	18.6	18.6	20.7	22
1996	8	JP5	9.7	15.6	15.8	15.8	15.9	2

**Table 6**

**Values of JP8 for Aromatics by Region**

(Volume in Millions of Gallons)

(Spec = 25.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	19.2	22.0	22.0	23.3	7
1991	5	JP8	8.5	20.6	22.6	22.6	23.5	14
1991	8	JP8	3.9	17.7	18.3	18.3	18.8	3
1992	5	JP8	4.4	21.3	22.6	22.6	24.3	7
1992	8	JP8	8.3	14.7	17.3	17.9	21.3	18
1993	3	JP8	53.9	10.1	17.5	18.7	24.9	69
1993	5	JP8	118.4	12.0	20.4	19.0	25.0	66
1993	7	JP8	20.6	16.0	18.6	18.3	21.5	11
1993	8	JP8	20.6	13.0	17.4	17.3	19.3	11
1994	2	JP8	28.5	12.2	15.0	14.8	20.0	20
1994	3	JP8	303.0	8.6	17.7	18.6	24.3	281
1994	5	JP8	151.1	12.7	21.8	19.6	24.8	88
1994	7	JP8	5.7	16.1	16.7	16.7	17.5	3
1994	8	JP8	43.1	12.8	18.7	18.7	23.1	31
1995	1	JP8	2.9	17.0	19.2	19.1	20.7	30
1995	2	JP8	126.6	11.0	15.3	15.3	22.6	83
1995	3	JP8	455.4	7.1	17.5	17.8	24.8	326
1995	4	JP8	9.9	13.7	17.3	17.0	21.2	16
1995	5	JP8	239.3	10.9	20.8	18.5	25.0	154
1995	7	JP8	65.1	9.7	16.7	16.7	21.8	21
1995	8	JP8	96.4	10.1	18.3	17.9	22.0	115
1996	1	JP8	18.8	17.5	19.5	19.9	23.7	61
1996	2	JP8	182.6	11.1	14.9	15.0	21.5	120
1996	3	JP8	608.8	9.1	17.8	18.6	24.9	366
1996	4	JP8	76.4	13.0	17.8	18.1	22.9	81
1996	5	JP8	412.7	8.6	18.7	17.0	24.6	217
1996	6	JP8	39.9	15.8	16.0	16.0	16.3	8
1996	7	JP8	259.5	12.2	18.4	17.3	23.0	106
1996	8	JP8	150.5	13.0	18.5	17.4	21.1	140

NATO/CEPS JA1 Min/Max: "7.1 - 24.0%". Mean of 18.2%.

Table 7

**Values of JP4 for Olefins by Region**

(Volume in Millions of Gallons)

(Spec = 5.0% max, "S" Revision, No Requirement)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	0.5	0.55	0.21	0.6	2
1990	3	JP4	14.4	0.2	0.53	1.07	1.6	27
1990	4	JP4	28.1	0.1	0.95	0.67	2.9	33
1990	5	JP4	53.3	0.2	0.85	0.50	1.2	14
1990	8	JP4	11.2	0.3	0.55	0.55	0.9	6
1991	1	JP4	46.4	0.4	1.16	1.13	2.3	36
1991	2	JP4	200.0	0.2	1.08	1.27	4.5	164
1991	3	JP4	803.8	0.1	0.86	1.07	3.8	393
1991	4	JP4	55.0	0.1	1.06	0.92	5.1	92
1991	5	JP4	190.4	0.1	0.67	0.65	3.5	88
1991	8	JP4	59.5	0.2	0.61	0.56	1.2	33
1992	1	JP4	21.2	0.6	1.10	1.10	1.9	17
1992	2	JP4	134.9	0.4	1.10	1.24	5.0	107
1992	3	JP4	502.2	0.1	0.74	0.92	2.5	353
1992	4	JP4	29.4	0.1	0.62	0.67	2.5	77
1992	5	JP4	165.7	0.2	0.99	1.08	2.9	100
1992	8	JP4	5.3	0.7	1.05	0.85	1.9	4
1993	2	JP4	149.7	0.6	1.27	1.59	4.0	83
1993	3	JP4	351.5	0.2	0.65	0.81	2.7	403
1993	4	JP4	90.2	0.2	0.67	0.73	2.1	194
1993	5	JP4	80.3	0.5	1.17	1.16	3.1	85
1993	8	JP4	9.4	2.0	2.83	2.84	4.0	6
1994	2	JP4	72.0	0.7	1.64	2.18	5.0	52
1994	3	JP4	27.2	0.2	0.76	0.83	1.8	18
1994	4	JP4	103.9	0.2	0.66	0.59	4.3	198
1995	4	JP4	61.9	0.1	0.62	0.62	2.4	133
1995	7	JP4	4.9	0.3	0.30	0.30	0.3	1
1995	8	JP4	0.1	0.2	0.20	0.20	0.2	3
1996	8	JP4	0.7	0.2	0.20	0.20	0.2	2

Table 8

**Values of JP5 for Olefins by Region**

(Volume in Millions of Gallons)

(Spec = 5.0% max, "S" Revision, No Requirement)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	0.4	0.48	0.48	0.5	6
1990	5	JP5	32.8	0.5	0.77	0.76	1.0	26
1991	2	JP5	5.9	1.0	1.00	1.00	1.0	9
1991	3	JP5	298.5	0.1	0.80	0.74	3.9	145
1991	5	JP5	159.0	0.8	1.16	1.13	2.5	99
1992	2	JP5	6.0	1.0	1.38	1.34	4.0	8
1992	3	JP5	232.9	0.3	0.84	0.87	2.8	105
1992	5	JP5	137.6	0.7	1.36	1.36	4.8	79
1993	3	JP5	266.9	0.1	0.85	0.87	3.6	123
1993	5	JP5	5.0	1.1	1.43	1.29	1.9	3
1993	7	JP5	55.6	0.3	0.78	0.82	1.2	9
1994	3	JP5	125.4	0.5	0.92	0.98	1.6	49
1994	7	JP5	23.5	0.3	0.66	0.63	0.9	7
1995	3	JP5	10.5	0.7	1.02	1.16	1.7	23
1995	7	JP5	23.1	0.5	0.79	0.71	1.2	8
1996	3	JP5	240.4	0.1	0.90	0.88	2.0	98
1996	5	JP5	29.5	0.9	1.18	1.13	1.4	9
1996	7	JP5	70.6	0.2	0.96	0.92	2.0	22
1996	8	JP5	9.7	0.7	0.75	0.75	0.8	2



**Table 9**

**Values of JP8 for Olefins by Region**

(Volume in Millions of Gallons)

(Spec = 5.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	0.5	0.74	0.75	1.0	7
1991	5	JP8	8.5	0.8	1.07	1.08	1.4	14
1991	8	JP8	3.9	0.6	0.87	0.87	1.2	3
1992	5	JP8	4.4	0.7	1.20	1.20	1.5	7
1992	8	JP8	8.3	0.6	0.60	0.60	0.6	1
1993	3	JP8	53.9	0.4	1.06	1.05	2.5	69
1993	5	JP8	118.4	0.1	1.60	1.95	3.6	66
1993	7	JP8	20.6	0.3	0.42	0.49	0.7	11
1993	8	JP8	20.6	0.7	1.27	1.22	1.9	7
1994	2	JP8	28.5	1.0	1.84	1.86	5.0	19
1994	3	JP8	303.0	0.1	1.14	1.29	4.0	281
1994	5	JP8	151.1	0.5	1.75	2.06	4.8	88
1994	7	JP8	5.7	0.5	0.63	0.65	0.9	3
1994	8	JP8	43.1	0.1	1.50	1.52	2.7	27
1995	1	JP8	2.9	0.4	1.23	1.24	2.1	30
1995	2	JP8	126.6	0.7	2.35	2.36	5.0	81
1995	3	JP8	455.4	0.3	1.23	1.31	4.6	324
1995	4	JP8	9.9	0.5	1.00	1.04	2.9	16
1995	5	JP8	239.3	0.6	2.17	2.34	4.4	154
1995	7	JP8	65.1	0.2	0.51	0.55	1.1	21
1995	8	JP8	96.4	0.3	0.96	0.92	4.1	66
1996	1	JP8	18.8	0.6	1.02	0.95	1.9	61
1996	2	JP8	182.6	0.5	1.82	1.98	5.0	120
1996	3	JP8	608.8	0.1	1.19	1.17	4.3	353
1996	4	JP8	76.4	0.2	0.98	0.93	3.0	75
1996	5	JP8	412.7	0.4	1.85	2.27	5.0	217
1996	6	JP8	39.9	0.3	0.30	0.30	0.3	8
1996	7	JP8	259.5	0.2	0.64	0.47	1.3	95
1996	8	JP8	150.5	0.3	0.80	0.38	3.1	91

NATO/CEPS JA1 Min/Max: "0.1 - 4.7%". Mean of 0.8%.

Table 10

**Values of JP4 for Total Sulfur by Region**

(Volume in Millions of Gallons)

(Spec = 0.40% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	0.00	0.164	0.094	0.26	3
1990	3	JP4	14.4	0.00	0.027	0.048	0.20	27
1990	4	JP4	28.1	0.00	0.010	0.010	0.03	33
1990	5	JP4	53.3	0.00	0.032	0.020	0.10	28
1990	8	JP4	11.2	0.01	0.047	0.042	0.08	8
1991	1	JP4	46.4	0.00	0.012	0.011	0.04	36
1991	2	JP4	200.0	0.00	0.082	0.057	0.28	166
1991	3	JP4	803.8	0.00	0.039	0.036	0.40	409
1991	4	JP4	55.0	0.00	0.021	0.019	0.11	93
1991	5	JP4	190.4	0.00	0.038	0.025	0.15	96
1991	8	JP4	59.5	0.01	0.027	0.023	0.06	43
1992	1	JP4	21.2	0.01	0.035	0.040	0.14	17
1992	2	JP4	134.9	0.01	0.085	0.048	0.29	107
1992	3	JP4	502.2	0.00	0.029	0.029	0.16	354
1992	4	JP4	29.4	0.00	0.035	0.035	0.20	78
1992	5	JP4	165.7	0.00	0.039	0.022	0.25	100
1992	8	JP4	5.3	0.02	0.050	0.034	0.12	4
1993	2	JP4	149.7	0.00	0.053	0.073	0.30	84
1993	3	JP4	351.5	0.00	0.024	0.026	0.17	404
1993	4	JP4	90.2	0.00	0.034	0.032	0.24	194
1993	5	JP4	80.3	0.00	0.033	0.019	0.15	85
1993	8	JP4	9.4	0.08	0.162	0.163	0.30	6
1994	2	JP4	72.0	0.02	0.058	0.066	0.40	52
1994	3	JP4	27.2	0.00	0.045	0.028	0.15	18
1994	4	JP4	103.9	0.00	0.029	0.032	0.12	204
1995	4	JP4	61.9	0.00	0.018	0.019	0.22	134
1995	7	JP4	4.9	0.04	0.040	0.040	0.04	1
1995	8	JP4	0.1	0.04	0.050	0.056	0.06	3
1996	8	JP4	0.7	0.04	0.045	0.048	0.05	2

Table 11

### **Values of JP5 for Total Sulfur by Region**

(Volume in Millions of Gallons)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	0.02	0.038	0.038	0.06	6
1990	5	JP5	32.8	0.00	0.017	0.020	0.07	26
1991	2	JP5	5.9	0.04	0.044	0.045	0.06	9
1991	3	JP5	298.5	0.00	0.042	0.055	0.15	145
1991	5	JP5	159.0	0.00	0.014	0.014	0.06	100
1992	2	JP5	6.0	0.00	0.055	0.054	0.12	8
1992	3	JP5	232.9	0.01	0.062	0.081	0.14	105
1992	5	JP5	137.6	0.00	0.013	0.015	0.05	79
1993	3	JP5	266.9	0.00	0.065	0.081	0.13	123
1993	5	JP5	5.0	0.00	0.007	0.010	0.01	3
1993	7	JP5	55.6	0.01	0.013	0.012	0.03	9
1994	3	JP5	125.4	0.00	0.079	0.089	0.13	49
1994	7	JP5	23.5	0.01	0.011	0.012	0.02	7
1995	3	JP5	10.5	0.00	0.056	0.014	0.11	23
1995	7	JP5	23.1	0.01	0.014	0.012	0.02	8
1996	3	JP5	240.4	0.00	0.081	0.080	0.14	98
1996	5	JP5	29.5	0.01	0.010	0.010	0.01	9
1996	7	JP5	70.6	0.01	0.035	0.030	0.14	22
1996	8	JP5	9.7	0.03	0.030	0.030	0.03	2

Table 12

**Values of JP8 for Total Sulfur by Region**

(Volume in Millions of Gallons)

(Spec = 0.30% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	0.00	0.021	0.023	0.07	7
1991	5	JP8	8.5	0.00	0.015	0.015	0.03	14
1991	8	JP8	3.9	0.01	0.010	0.010	0.01	3
1992	5	JP8	4.4	0.00	0.014	0.014	0.03	7
1992	8	JP8	8.3	0.07	0.087	0.085	0.10	18
1993	3	JP8	53.9	0.00	0.040	0.055	0.16	69
1993	5	JP8	118.4	0.00	0.018	0.013	0.04	65
1993	7	JP8	20.6	0.01	0.021	0.025	0.07	11
1993	8	JP8	20.6	0.01	0.053	0.035	0.09	11
1994	2	JP8	28.5	0.01	0.065	0.067	0.13	20
1994	3	JP8	303.0	0.00	0.042	0.060	0.20	281
1994	5	JP8	151.1	0.00	0.018	0.015	0.05	88
1994	7	JP8	5.7	0.01	0.037	0.039	0.05	3
1994	8	JP8	43.1	0.01	0.033	0.023	0.09	31
1995	1	JP8	2.9	0.00	0.014	0.014	0.03	30
1995	2	JP8	126.6	0.03	0.092	0.087	0.26	83
1995	3	JP8	455.4	0.00	0.053	0.059	0.30	326
1995	4	JP8	9.9	0.01	0.030	0.030	0.06	16
1995	5	JP8	239.3	0.00	0.037	0.027	0.13	154
1995	7	JP8	65.1	0.01	0.054	0.051	0.30	21
1995	8	JP8	96.4	0.01	0.072	0.053	0.11	115
1996	1	JP8	18.8	0.01	0.023	0.037	0.09	62
1996	2	JP8	182.6	0.03	0.085	0.089	0.26	120
1996	3	JP8	608.8	0.00	0.042	0.035	0.30	366
1996	4	JP8	76.4	0.00	0.026	0.023	0.10	81
1996	5	JP8	412.7	0.00	0.048	0.035	0.30	217
1996	6	JP8	39.9	0.01	0.010	0.010	0.01	8
1996	7	JP8	259.5	0.00	0.079	0.101	0.28	106
1996	8	JP8	150.5	0.00	0.067	0.053	0.11	140

NATO/CEPS JA1 Min/Max: "0.00 - 0.25%". Mean of 0.06%.

***Table 13***

***Values of JP4 for Mercaptan Sulfur by Region***

(Volume in Millions of Gallons)

(Spec = 0.002% max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP4	14.4	0.0001	0.0003	0.0009	0.0019	26
1990	4	JP4	28.1	0.0010	0.0015	0.0006	0.0020	12
1990	5	JP4	53.3	0.0002	0.0005	0.0003	0.0011	18
1990	8	JP4	11.2	0.0003	0.0003	0.0003	0.0003	1
1991	1	JP4	46.4	0.0010	0.0011	0.0011	0.0020	36
1991	2	JP4	200.0	0.0001	0.0009	0.0006	0.0017	97
1991	3	JP4	803.8	0.0001	0.0007	0.0006	0.0020	344
1991	4	JP4	55.0	0.0002	0.0017	0.0010	0.0020	59
1991	5	JP4	190.4	0.0001	0.0007	0.0005	0.0020	64
1991	8	JP4	59.5	0.0002	0.0003	0.0002	0.0003	3
1992	1	JP4	21.2	0.0010	0.0011	0.0011	0.0020	17
1992	2	JP4	134.9	0.0001	0.0009	0.0006	0.0019	53
1992	3	JP4	502.2	0.0001	0.0005	0.0005	0.0020	230
1992	4	JP4	29.4	0.0003	0.0017	0.0009	0.0020	56
1992	5	JP4	165.7	0.0001	0.0006	0.0003	0.0018	71
1992	8	JP4	5.3	0.0006	0.0006	0.0006	0.0006	1
1993	2	JP4	149.7	0.0008	0.0010	0.0002	0.0013	9
1993	3	JP4	351.5	0.0001	0.0004	0.0004	0.0020	231
1993	4	JP4	90.2	0.0002	0.0016	0.0007	0.0020	122
1993	5	JP4	80.3	0.0001	0.0004	0.0003	0.0013	85
1993	8	JP4	9.4	0.0011	0.0014	0.0014	0.0019	6
1994	2	JP4	72.0	0.0005	0.0009	0.0004	0.0015	15
1994	3	JP4	27.2	0.0001	0.0009	0.0008	0.0016	14
1994	4	JP4	103.9	0.0002	0.0018	0.0006	0.0020	94
1995	4	JP4	61.9	0.0004	0.0015	0.0008	0.0020	86
1995	7	JP4	4.9	0.0013	0.0013	0.0013	0.0013	1

**Table 14**

***Values of JP5 for Mercaptan Sulfur by Region***

(Volume in Millions of Gallons)

(Spec = 0.002% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	0.0002	0.0007	0.0006	0.0010	6
1991	2	JP5	5.9	0.0012	0.0015	0.0015	0.0017	9
1991	3	JP5	298.5	0.0001	0.0007	0.0006	0.0016	144
1991	5	JP5	159.0	0.0001	0.0001	0.0001	0.0001	8
1992	2	JP5	6.0	0.0012	0.0016	0.0002	0.0020	8
1992	3	JP5	232.9	0.0001	0.0008	0.0008	0.0016	105
1992	5	JP5	137.6	0.0001	0.0002	0.0004	0.0009	20
1993	3	JP5	266.9	0.0001	0.0008	0.0009	0.0019	123
1993	5	JP5	5.0	0.0004	0.0004	0.0004	0.0004	1
1994	3	JP5	125.4	0.0001	0.0009	0.0010	0.0019	49
1995	3	JP5	10.5	0.0001	0.0007	0.0003	0.0015	23
1995	7	JP5	23.1	0.0002	0.0002	0.0002	0.0002	1
1996	3	JP5	240.4	0.0001	0.0010	0.0010	0.0020	98
1996	5	JP5	29.5	0.0007	0.0012	0.0006	0.0017	2
1996	7	JP5	70.6	0.0001	0.0006	0.0004	0.0018	15
1996	8	JP5	9.7	0.0010	0.0010	0.0010	0.0010	2

**Table 15**

***Values of JP8 for Mercaptan Sulfur by Region***

(Volume in Millions of Gallons)

(Spec = 0.002% max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1991	8	JP8	3.9	0.0003	0.0004	0.0004	0.0004	3
1992	8	JP8	8.3	0.0004	0.0004	0.0005	0.0007	18
1993	3	JP8	53.9	0.0001	0.0007	0.0006	0.0020	52
1993	5	JP8	118.4	0.0001	0.0004	0.0004	0.0020	66
1993	7	JP8	20.6	0.0001	0.0002	0.0003	0.0006	11
1993	8	JP8	20.6	0.0004	0.0004	0.0004	0.0004	4
1994	2	JP8	28.5	0.0001	0.0014	0.0006	0.0020	11
1994	3	JP8	303.0	0.0001	0.0007	0.0008	0.0020	225
1994	5	JP8	151.1	0.0001	0.0003	0.0005	0.0010	88
1994	7	JP8	5.7	0.0001	0.0003	0.0003	0.0004	3
1994	8	JP8	43.1	0.0003	0.0006	0.0001	0.0020	8
1995	1	JP8	2.9	0.0001	0.0001	0.0002	0.0003	13
1995	2	JP8	126.6	0.0007	0.0014	0.0006	0.0020	42
1995	3	JP8	455.4	0.0001	0.0010	0.0008	0.0020	250
1995	4	JP8	9.9	0.0010	0.0015	0.0067	0.0020	7
1995	5	JP8	239.3	0.0001	0.0005	0.0007	0.0019	151
1995	7	JP8	65.1	0.0001	0.0009	0.0010	0.0025	20
1995	8	JP8	96.4	0.0003	0.0006	0.0003	0.0008	89
1996	1	JP8	18.8	0.0003	0.0009	0.0006	0.0018	11
1996	2	JP8	182.6	0.0001	0.0012	0.0009	0.0020	89
1996	3	JP8	609.0	0.0001	0.0010	0.0004	0.0020	230
1996	4	JP8	76.4	0.0010	0.0018	0.0010	0.0020	55
1996	5	JP8	412.7	0.0001	0.0005	0.0006	0.0020	169
1996	6	JP8	39.9	0.0003	0.0003	0.0004	0.0004	8
1996	7	JP8	259.5	0.0001	0.0013	0.0012	0.0029	94
1996	8	JP8	150.5	0.0001	0.0005	0.0002	0.0020	116

NATO/CEPS JA1 Min/Max: "0.0001 - 0.0030%". Mean of 0.0008%.

Table 16

**Values of JP4 for Particulate Contamination by Region**

(Volume in Millions of Gallons)

(Spec = 1.0 mg/L max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	0.2	0.70	0.83	1.0	3
1990	3	JP4	14.4	0.1	0.25	0.40	0.6	27
1990	4	JP4	28.1	0.1	0.30	0.27	1.0	33
1990	5	JP4	53.3	0.1	0.30	0.22	0.8	25
1990	8	JP4	11.2	0.1	0.37	0.44	0.8	8
1991	1	JP4	46.4	0.1	0.33	0.33	0.9	34
1991	2	JP4	200.0	0.03	0.28	0.28	0.8	166
1991	3	JP4	803.8	0.0	0.37	0.39	1.0	409
1991	4	JP4	55.0	0.1	0.32	0.26	0.9	89
1991	5	JP4	190.4	0.0	0.24	0.24	0.8	86
1991	8	JP4	59.5	0.08	0.43	0.48	0.9	43
1992	1	JP4	21.3	0.1	0.34	0.37	0.7	17
1992	2	JP4	134.9	0.05	0.30	0.30	0.9	106
1992	3	JP4	502.2	0.03	0.36	0.41	1.0	353
1992	4	JP4	29.4	0.08	0.29	0.29	1.0	76
1992	5	JP4	165.7	0.1	0.30	0.31	1.0	91
1992	8	JP4	5.3	0.2	0.60	0.68	0.9	4
1993	2	JP4	149.7	0.1	0.27	0.26	0.7	82
1993	3	JP4	351.5	0.03	0.45	0.49	1.0	404
1993	4	JP4	90.2	0.03	0.36	0.32	0.9	182
1993	5	JP4	80.3	0.1	0.23	0.23	1.0	84
1993	8	JP4	9.4	0.4	0.55	0.57	0.7	6
1994	2	JP4	72.0	0.1	0.39	0.37	1.0	52
1994	3	JP4	27.2	0.1	0.52	0.53	1.0	18
1994	4	JP4	103.9	0.05	0.29	0.31	1.0	202
1995	4	JP4	61.9	0.03	0.34	0.37	1.0	133
1995	7	JP4	4.9	0.9	0.90	0.90	0.9	1
1995	8	JP4	0.1	0.4	0.68	0.49	0.9	3
1996	8	JP4	0.7	0.4	0.60	0.69	0.8	2



**Table 17**

***Values of JP5 for Particulate Contamination by Region***

(Volume in Millions of Gallons)

(Spec = 1.0 mg/L max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	0.3	0.45	0.45	0.7	6
1990	5	JP5	32.8	0.1	0.31	0.25	1.0	21
1991	2	JP5	5.9	0.1	0.65	0.61	1.0	9
1991	3	JP5	298.5	0.05	0.43	0.36	1.0	145
1991	5	JP5	159.0	0.03	0.15	0.11	0.3	76
1992	2	JP5	6.0	0.4	0.70	0.69	1.0	8
1992	3	JP5	232.9	0.02	0.39	0.33	1.0	105
1992	5	JP5	137.6	0.1	0.21	0.18	0.8	67
1993	3	JP5	266.9	0.03	0.37	0.30	1.0	123
1993	5	JP5	5.0	0.05	0.13	0.09	0.2	3
1993	7	JP5	55.6	0.25	0.63	0.63	0.8	9
1994	3	JP5	125.4	0.03	0.25	0.21	0.8	49
1994	7	JP5	23.5	0.3	0.53	0.53	0.9	7
1995	3	JP5	10.5	0.03	0.22	0.16	1.0	23
1995	7	JP5	23.1	0.02	0.33	0.35	0.6	8
1996	3	JP5	240.4	0.03	0.15	0.15	0.8	97
1996	5	JP5	29.5	0.04	0.18	0.13	0.3	8
1996	7	JP5	70.6	0.2	0.49	0.47	1.0	22
1996	8	JP5	9.7	0.5	0.50	0.50	0.5	2

Table 18

**Values of JP8 for Particulate Contamination by Region**

(Volume in Millions of Gallons)  
(Spec = 1.0 mg/L max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	0.1	0.35	0.30	0.8	6
1991	5	JP8	8.5	0.1	0.27	0.17	0.6	9
1991	8	JP8	3.9	0.6	0.79	0.79	0.9	3
1992	5	JP8	4.4	0.1	0.16	0.16	0.3	7
1992	8	JP8	8.3	0.03	0.36	0.46	1.1	18
1993	3	JP8	53.9	0.1	0.41	0.32	1.0	69
1993	5	JP8	118.4	0.1	0.26	0.31	0.9	66
1993	7	JP8	20.6	0.1	0.41	0.58	1.0	11
1993	8	JP8	20.6	0.3	0.42	0.35	0.8	10
1994	2	JP8	28.5	0.1	0.49	0.46	1.0	20
1994	3	JP8	303.0	0.1	0.42	0.39	1.0	279
1994	5	JP8	151.1	0.1	0.21	0.32	1.0	88
1994	7	JP8	5.7	0.1	0.23	0.22	0.4	3
1994	8	JP8	43.1	0.1	0.30	0.32	0.9	31
1995	1	JP8	2.9	0.1	0.32	0.29	0.7	30
1995	2	JP8	126.6	0.1	0.44	0.47	1.0	83
1995	3	JP8	455.4	0.03	0.34	0.31	1.0	322
1995	4	JP8	9.9	0.05	0.42	0.48	1.0	16
1995	5	JP8	239.3	0.1	0.20	0.27	1.0	154
1995	7	JP8	65.1	0.1	0.49	0.47	0.8	21
1995	8	JP8	96.4	0.05	0.35	0.36	1.0	113
1996	1	JP8	18.8	0.05	0.21	0.28	1.0	59
1996	2	JP8	182.6	0.05	0.44	0.43	1.0	119
1996	3	JP8	608.8	0.01	0.31	0.25	1.0	361
1996	4	JP8	76.4	0.1	0.34	0.39	0.8	81
1996	5	JP8	412.7	0.01	0.27	0.31	1.0	216
1996	6	JP8	39.9	0.5	0.56	0.56	0.6	8
1996	7	JP8	259.5	0.03	0.33	0.36	1.0	94
1996	8	JP8	150.51	0.05	0.38	0.55	1.0	140

NATO/CEPS JA1 Min/Max: No Specification Requirement - Value Not Reported

***Table 19***

***Values of JP4 for Filtration Time by Region***

(Volume in Millions of Gallons)  
(Spec = 10 minutes max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	2	3.3	2.8	4	3
1990	3	JP4	14.4	3	4.9	7.1	10	27
1990	4	JP4	28.1	4	5.1	5.0	9	33
1990	5	JP4	53.3	2	3.4	3.0	6	28
1990	8	JP4	11.2	2	3.1	3.0	4	8
1991	1	JP4	46.4	3	5.4	5.5	10	36
1991	2	JP4	200.0	2	4.4	4.4	9	166
1991	3	JP4	803.8	2	4.0	4.0	9	409
1991	4	JP4	55.0	2	5.3	4.9	10	93
1991	5	JP4	190.4	2	3.5	3.3	9	96
1991	8	JP4	59.5	2	3.6	3.3	7	43
1992	1	JP4	21.2	2	4.6	4.5	6	17
1992	2	JP4	134.9	2	4.2	4.0	8	107
1992	3	JP4	502.2	2	3.9	3.9	10	354
1992	4	JP4	29.4	3	4.7	4.8	8	78
1992	5	JP4	165.7	2	3.5	3.3	8	100
1992	8	JP4	5.3	3	3.5	3.4	4	4
1993	2	JP4	149.7	2	3.3	3.3	5	84
1993	3	JP4	351.5	2	4.3	4.7	13	404
1993	4	JP4	90.2	3	4.7	4.8	9	194
1993	5	JP4	80.3	2	3.9	3.8	7	85
1993	8	JP4	9.4	4	5.5	5.5	7	6
1994	2	JP4	72.0	2	3.5	3.3	8	52
1994	3	JP4	27.2	2	3.8	3.6	5	18
1994	4	JP4	103.9	2	4.5	4.5	8	204
1995	4	JP4	61.9	2	4.5	4.4	9	134
1995	7	JP4	4.9	4	4.0	4.0	4	1
1995	8	JP4	0.1	5	5.6	5.4	6	3
1996	8	JP4	0.7	5	6.0	6.5	7	2

Table 20

**Values of JP5 for Filtration Time by Region**

(Volume in Millions of Gallons)  
(Spec = 15 minutes max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	9	9.7	9.6	10	6
1990	5	JP5	32.8	2	3.5	3.5	4	26
1991	2	JP5	5.9	3	3.7	3.8	4	9
1991	3	JP5	298.5	2	4.3	3.6	12	145
1991	5	JP5	159.0	3	3.6	3.7	6	100
1992	2	JP5	6.0	3	4.0	4.0	5	8
1992	3	JP5	232.9	2	4.2	3.9	9	104
1992	5	JP5	137.6	3	3.7	3.6	13	79
1993	3	JP5	266.9	2	3.7	3.2	13	123
1993	5	JP5	5.0	3	3.0	3.0	3	3
1993	7	JP5	55.6	2	4.8	4.7	7	9
1994	3	JP5	125.4	2	3.3	3.0	8	49
1994	7	JP5	23.5	3	4.7	5.0	8	7
1995	3	JP5	10.5	2	3.0	3.2	7	243
1995	7	JP5	23.1	4	4.6	4.3	6	8
1996	3	JP5	240.4	2	3.1	3.1	6	98
1996	5	JP5	29.5	3	3.7	3.4	4	9
1996	7	JP5	70.6	4	5.5	5.5	9	22
1996	8	JP5	9.7	3	3.5	3.5	4	2

**Table 21**

***Values of JP8 for Filtration Time by Region***

(Volume in Millions of Gallons)

(Spec = 15 minutes max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	5	JP8	4.0	3	3.9	3.9	4	7
1991	5	JP8	8.5	3	5.5	5.0	8	13
1991	8	JP8	3.9	8	9.3	9.3	10	3
1992	5	JP8	4.4	5	6.6	6.6	8	7
1992	8	JP8	8.3	6	7.5	7.4	9	18
1993	3	JP8	53.9	4	7.1	6.2	12	69
1993	5	JP8	118.4	3	6.7	6.6	11	66
1993	7	JP8	20.6	5	7.5	8.7	12	11
1993	8	JP8	20.6	6	7.2	6.4	8	10
1994	2	JP8	28.5	5	7.0	7.0	10	20
1994	3	JP8	303.0	3	6.9	6.1	14	279
1994	5	JP8	151.1	3	6.1	6.2	12	88
1994	7	JP8	5.7	6	6.7	6.7	7	3
1994	8	JP8	43.1	5	7.0	6.8	12	31
1995	1	JP8	2.9	6	7.1	7.0	10	30
1995	2	JP8	126.6	3	7.3	7.0	13	83
1995	3	JP8	455.4	3	6.5	6.0	15	320
1995	4	JP8	9.9	6	8.1	8.0	10	16
1995	5	JP8	239.3	4	5.6	5.8	12	154
1995	7	JP8	65.1	4	7.0	7.4	13	21
1995	8	JP8	96.4	4	6.7	6.3	11	115
1996	1	JP8	18.8	3	7.1	4.3	12	61
1996	2	JP8	182.6	3	7.9	7.8	13	119
1996	3	JP8	608.8	3	6.4	6.3	13	360
1996	4	JP8	76.4	4	7.2	7.0	11	81
1996	5	JP8	412.7	3	6.3	7.0	14	217
1996	6	JP8	39.9	8	8.3	8.3	9	8
1996	7	JP8	259.5	3	6.4	6.2	14	95
1996	8	JP8	147.0	4	7.2	7.2	14	140

NATO/CEPS JA1 Min/Max: No Specification Requirement - Value Not Reported

Table 22

**Values of JP4 for Total Acid Number by Region**

(Volume in Millions of Gallons)  
(Spec = 0.015mg KOH/g max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	0.003	0.0037	0.0034	0.005	3
1990	3	JP4	14.4	0.002	0.0050	0.0035	0.009	27
1990	4	JP4	28.1	0.001	0.0041	0.0037	0.008	33
1990	5	JP4	53.3	0.003	0.0067	0.0059	0.012	21
1990	8	JP4	11.2	0.001	0.0055	0.0056	0.012	8
1991	1	JP4	46.4	0.002	0.0076	0.0079	0.015	36
1991	2	JP4	200.0	0.001	0.0038	0.0039	0.014	164
1991	3	JP4	803.8	0.001	0.0047	0.0041	0.015	409
1991	4	JP4	55.0	0.001	0.0039	0.0039	0.012	93
1991	5	JP4	190.4	0.001	0.0065	0.0062	0.014	78
1991	8	JP4	59.5	0.002	0.0062	0.0054	0.012	43
1992	1	JP4	21.2	0.003	0.0048	0.0042	0.008	17
1992	2	JP4	134.9	0.001	0.0052	0.0054	0.014	106
1992	3	JP4	502.2	0.001	0.0042	0.0040	0.013	354
1992	4	JP4	29.4	0.001	0.0052	0.0057	0.011	75
1992	5	JP4	165.7	0.003	0.0067	0.0075	0.015	100
1992	8	JP4	5.3	0.004	0.0055	0.0059	0.006	4
1993	2	JP4	149.7	0.001	0.0067	0.0094	0.015	84
1993	3	JP4	351.5	0.001	0.0046	0.0048	0.014	404
1993	4	JP4	90.2	0.001	0.0046	0.0050	0.014	192
1993	5	JP4	80.3	0.001	0.0043	0.0043	0.014	85
1993	8	JP4	9.4	0.009	0.0128	0.0129	0.015	6
1994	2	JP4	72.0	0.003	0.0063	0.0076	0.015	52
1994	3	JP4	27.2	0.002	0.0043	0.0044	0.008	18
1994	4	JP4	103.9	0.001	0.0048	0.0045	0.015	197
1995	4	JP4	61.9	0.000	0.0048	0.0050	0.017	133
1995	7	JP4	4.9	0.006	0.0060	0.0060	0.006	1
1995	8	JP4	0.1	0.011	0.0117	0.0125	0.013	3
1996	8	JP4	0.7	0.012	0.0130	0.0125	0.014	2

***Table 23***

***Values of JP5 for Total Acid Number by Region***

(Volume in Millions of Gallons)

(Spec = 0.015 mg KOH/g max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	0.006	0.0072	0.0072	0.010	6
1990	5	JP5	32.8	0.003	0.0062	0.0037	0.010	13
1991	2	JP5	5.9	0.005	0.0088	0.0086	0.013	9
1991	3	JP5	298.5	0.001	0.0057	0.0058	0.015	145
1991	5	JP5	159.0	0.001	0.0050	0.0032	0.013	67
1992	2	JP5	6.0	0.007	0.0114	0.0114	0.014	8
1992	3	JP5	232.9	0.002	0.0058	0.0060	0.014	105
1992	5	JP5	137.6	0.001	0.0056	0.0062	0.015	79
1993	3	JP5	266.9	0.001	0.0050	0.0051	0.015	121
1993	5	JP5	5.0	0.009	0.0093	0.0092	0.010	3
1993	7	JP5	55.6	0.002	0.0044	0.0040	0.009	9
1994	3	JP5	125.4	0.001	0.0046	0.0046	0.009	49
1994	7	JP5	23.5	0.002	0.0046	0.0050	0.009	7
1995	3	JP5	10.5	0.001	0.0034	0.0043	0.008	23
1995	7	JP5	23.1	0.004	0.0060	0.0063	0.009	8
1996	3	JP5	240.4	0.001	0.0032	0.0031	0.013	97
1996	5	JP5	29.5	0.003	0.0052	0.0052	0.014	9
1996	7	JP5	70.6	0.003	0.0049	0.0049	0.009	22
1996	8	JP5	9.7	0.003	0.0030	0.0030	0.003	2

Table 24

**Values of JP8 for Total Acid Number by Region**

(Volume in Millions of Gallons)  
(Spec = 0.015 mg KOH/g max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	0.003	0.0071	0.0073	0.010	7
1991	5	JP8	8.5	0.003	0.0074	0.0072	0.012	14
1991	8	JP8	3.9	0.004	0.0040	0.0040	0.004	3
1992	5	JP8	4.4	0.004	0.0056	0.0056	0.008	7
1992	8	JP8	8.3	0.010	0.0183	0.0172	0.020	18
1993	3	JP8	53.9	0.001	0.0039	0.0038	0.010	68
1993	5	JP8	118.4	0.001	0.0034	0.0033	0.006	63
1993	7	JP8	20.6	0.002	0.0049	0.0056	0.009	11
1993	8	JP8	20.6	0.004	0.0109	0.0097	0.019	11
1994	2	JP8	28.5	0.002	0.0053	0.0052	0.011	20
1994	3	JP8	303.0	0.001	0.0035	0.0034	0.020	281
1994	5	JP8	151.1	0.001	0.0022	0.0027	0.013	88
1994	7	JP8	5.7	0.002	0.0033	0.0032	0.005	3
1994	8	JP8	43.1	0.001	0.0071	0.0051	0.020	31
1995	1	JP8	2.9	0.001	0.0024	0.0023	0.010	30
1995	2	JP8	126.6	0.002	0.0053	0.0053	0.012	83
1995	3	JP8	455.4	0.001	0.0037	0.0035	0.012	326
1995	4	JP8	9.9	0.003	0.0065	0.0063	0.013	16
1995	5	JP8	239.3	0.001	0.0025	0.0028	0.013	154
1995	7	JP8	65.1	0.002	0.0047	0.0050	0.009	21
1995	8	JP8	96.4	0.001	0.0147	0.0113	0.020	115
1996	1	JP8	18.8	0.001	0.0041	0.0066	0.012	61
1996	2	JP8	182.6	0.001	0.0055	0.0054	0.014	115
1996	3	JP8	608.8	0.001	0.0041	0.0038	0.015	365
1996	4	JP8	76.4	0.001	0.0058	0.0056	0.015	80
1996	5	JP8	412.7	0.001	0.0038	0.0040	0.015	217
1996	6	JP8	39.9	0.005	0.0058	0.0059	0.006	8
1996	7	JP8	259.5	0.001	0.0052	0.0052	0.015	106
1996	8	JP8	150.5	0.001	0.0139	0.0090	0.020	140

NATO/CEPS JA1 Min/Max: "0.001 - 0.015". Mean of 0.003 mgKOH/g



**Table 25**

***Values of JP4 for Smoke Point by Region***

(Volume in Millions of Gallons)

(Spec = 20.0 mm min)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	2	JP4	2.2	23	23.3	23.2	24	3
1990	3	JP4	14.4	25	28.5	28.4	30	27
1990	4	JP4	28.1	20	27.5	29.7	33	33
1990	5	JP4	53.3	24	27.0	27.7	31	28
1990	8	JP4	11.2	21	24.4	25.2	30	8
1991	1	JP4	46.4	20	24.6	24.4	30	36
1991	2	JP4	200.0	22	27.5	28.1	31	166
1991	3	JP4	803.8	20	26.7	24.8	37	409
1991	4	JP4	55.0	21	28.0	28.1	36	93
1991	5	JP4	190.4	21	26.1	26.5	31	96
1991	8	JP4	59.5	20	26.0	26.4	30	43
1992	1	JP4	21.2	22	24.7	24.8	27	17
1992	2	JP4	134.9	21	26.9	28.2	31	107
1992	3	JP4	502.2	20	26.6	24.5	33	354
1992	4	JP4	29.4	21	27.5	28.2	41	78
1992	5	JP4	165.7	21	26.2	26.9	35	100
1992	8	JP4	5.3	21	26.6	28.1	31	4
1993	2	JP4	149.7	21	25.5	26.9	33	84
1993	3	JP4	351.5	20	26.9	24.5	38	404
1993	4	JP4	90.2	23	28.3	29.8	39	194
1993	5	JP4	80.3	21	26.3	27.0	34	85
1993	8	JP4	9.4	20	20.0	20.0	20	6
1994	2	JP4	72.0	22	24.5	26.2	30	52
1994	3	JP4	27.2	23	26.1	25.7	29	18
1994	4	JP4	103.9	21	27.6	25.2	37	192
1995	4	JP4	61.9	20	25.9	20.6	35	120
1995	7	JP4	4.9	26	26.0	26.0	26	1
1995	8	JP4	0.1	26	26.0	26.0	26	3
1996	8	JP4	0.7	26	26.0	26.0	26	2

Table 26

**Values of JP5 for Smoke Point by Region**

(Volume in Millions of Gallons)

(Spec = 19.0 mm max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	20	20.0	20.0	20	6
1990	5	JP5	32.8	19	19.5	19.5	20	26
1991	2	JP5	5.9	24	24.0	24.0	26	9
1991	3	JP5	298.5	19	21.8	21.0	25	145
1991	5	JP5	159.0	19	19.3	19.3	22	100
1992	2	JP5	6.0	24	25.1	25.1	26	8
1992	3	JP5	232.9	20	21.5	20.8	25	105
1992	5	JP5	137.6	19	19.8	19.8	22	79
1993	3	JP5	266.9	20	22.2	8.5	25	68
1993	5	JP5	5.0	19	20.0	19.8	20	3
1993	7	JP5	55.6	21	23.2	23.4	24	9
1994	3	JP5	125.4	21	22.7	21.0	26	10
1994	7	JP5	23.5	21	22.6	15.6	23	5
1995	3	JP5	10.5	19	19.5	15.9	21	4
1995	7	JP5	23.1	21	21.0	24.8	21	3
1996	3	JP5	240.4	19	20.1	16.1	22	74
1996	5	JP5	29.5	19	20.0	20.1	21	9
1996	7	JP5	70.6	21	22.3	17.7	25	17
1996	8	JP5	9.7	21	22.0	22.0	23	2

***Table 27***

***Values of JP8 for Smoke Point by Region***

(Volume in Millions of Gallons)

(Spec = 25 mm min or 19 min w/ 3.0% Naphthalenes)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	5	JP8	4.0	19	19.6	19.5	20	7
1991	5	JP8	8.5	19	19.3	19.3	20	14
1991	8	JP8	3.9	20	20.7	20.7	22	3
1992	5	JP8	4.4	19	19.8	19.8	21	7
1992	8	JP8	8.3	19	20.9	20.6	21	18
1993	3	JP8	53.9	20	23.5	22.2	30	69
1993	5	JP8	118.4	19	20.7	20.8	23	66
1993	7	JP8	20.6	24	25.5	25.1	26	11
1993	8	JP8	20.6	20	21.7	22.2	24	11
1994	2	JP8	28.5	21	23.9	23.8	26	20
1994	3	JP8	303.0	19	23.6	22.3	28	279
1994	5	JP8	151.1	19	20.1	20.5	22	88
1994	7	JP8	5.7	25	25.3	25.3	26	3
1994	8	JP8	43.1	19	21.3	21.4	25	31
1995	1	JP8	2.9	20	22.3	22.4	29	30
1995	2	JP8	126.6	20	24.3	24.0	26	82
1995	3	JP8	455.4	20	22.9	22.2	33	324
1995	4	JP8	9.9	21	23.3	23.6	27	16
1995	5	JP8	239.3	19	20.2	20.7	23	154
1995	7	JP8	65.1	19	25.3	25.4	29	21
1995	8	JP8	96.4	20	21.1	21.2	28	114
1996	1	JP8	18.8	20	21.6	22.8	23	61
1996	2	JP8	182.6	20	24.5	24.3	28	120
1996	3	JP8	608.8	19	23.0	21.9	30	364
1996	4	JP8	76.4	21	24.5	24.4	29	81
1996	5	JP8	412.7	19	20.3	20.5	27	217
1996	6	JP8	39.9	27	27.0	27.0	27	8
1996	7	JP8	259.5	19	25.3	24.3	27	106
1996	8	JP8	150.5	20	21.9	23.3	25	140

NATO/CEPS JA1 Min/Max: "19 - 31 mm". Mean of 24 mm.

**Table 28**

**Values of JP8 for Naphthalene by Region**

(Volume in Millions of Gallons)

(Spec = 3.0% max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	1.0	1.04	1.05	1.3	7
1991	5	JP8	8.5	0.4	0.80	0.68	1.4	12
1991	8	JP8	3.9	1.0	1.30	1.30	1.5	3
1992	5	JP8	4.4	0.6	1.44	1.44	2.1	7
1992	8	JP8	8.3	2.4	2.54	2.53	2.8	18
1993	3	JP8	53.9	0.1	1.33	1.30	2.9	69
1993	5	JP8	118.4	0.2	1.16	0.74	2.0	59
1993	7	JP8	20.6	0.6	0.77	0.43	1.0	3
1993	8	JP8	20.6	0.5	1.51	0.94	2.7	11
1994	2	JP8	28.5	1.1	1.29	0.99	1.6	16
1994	3	JP8	303.0	0.1	1.39	1.323	3.0	280
1994	5	JP8	151.1	0.2	1.34	1.06	3.0	85
1994	7	JP8	5.7	0.3	0.40	0.29	0.5	2
1994	8	JP8	43.1	0.1	1.00	0.73	2.8	31
1995	1	JP8	2.9	0.5	0.89	0.87	1.7	30
1995	2	JP8	126.6	0.8	1.23	0.90	2.0	61
1995	3	JP8	455.4	0.1	1.27	1.14	2.9	325
1995	4	JP8	9.9	0.1	0.67	0.41	1.1	9
1995	5	JP8	239.3	0.2	1.80	1.36	3.0	154
1995	7	JP8	65.1	0.2	1.55	0.97	3	10
1995	8	JP8	96.4	0.1	2.13	1.63	2.9	115
1996	1	JP8	18.8	0.8	1.39	2.01	2.9	61
1996	2	JP8	182.6	0.6	1.33	1.00	2.9	90
1996	3	JP8	608.8	0.1	1.24	1.12	3.0	332
1996	4	JP8	76.4	0.7	0.93	0.39	1.1	19
1996	5	JP8	412.7	0.1	1.42	0.90	3.0	215
1996	6	JP8	39.9	0.5	0.52	0.36	0.5	5
1996	7	JP8	259.5	0.1	1.57	0.83	2.9	75
1996	8	JP8	150.5	0.3	2.16	1.11	3.0	123

NATO/CEPS JA1 Min/Max: "0.1 - 2.7%". Mean of 1.2%.

***Table 29***

***Values of JP4 for Hydrogen Content by Region***

(Volume in Millions of Gallons)

(Spec = 13.5% min)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	2	JP4	2.2	14.1	14.17	14.18	14.2	3
1990	3	JP4	14.4	14.1	14.36	14.46	14.6	27
1990	4	JP4	28.1	13.7	14.41	14.38	14.8	33
1990	5	JP4	53.3	14.0	14.24	14.25	14.4	28
1990	8	JP4	11.2	13.9	14.30	14.23	14.8	8
1991	1	JP4	46.4	14.4	14.51	14.51	14.6	36
1991	2	JP4	200.0	13.6	14.41	14.41	14.8	166
1991	3	JP4	803.8	13.7	14.38	14.32	15.5	408
1991	4	JP4	55.0	13.8	14.38	13.85	14.7	88
1991	5	JP4	190.4	13.1	14.23	13.97	14.7	94
1991	8	JP4	59.5	13.6	14.36	14.36	14.7	43
1992	1	JP4	21.2	14.5	14.60	14.60	14.7	17
1992	2	JP4	134.9	13.8	14.42	14.17	14.8	103
1992	3	JP4	502.2	13.8	14.38	14.25	15.2	330
1992	4	JP4	29.4	12.4	14.36	11.67	14.8	61
1992	5	JP4	165.7	13.6	14.15	14.15	14.6	100
1992	8	JP4	5.3	14.0	14.28	14.35	14.5	4
1993	2	JP4	149.7	13.6	14.23	13.70	14.6	83
1993	3	JP4	351.5	13.2	14.33	14.42	15.0	403
1993	4	JP4	90.2	13.5	14.30	14.32	15.3	193
1993	5	JP4	80.3	13.0	14.05	14.07	14.5	85
1993	8	JP4	9.4	13.5	13.60	13.58	13.8	6
1994	2	JP4	72.0	13.8	14.28	14.21	14.6	52
1994	3	JP4	27.2	13.9	14.35	14.36	14.8	18
1994	4	JP4	103.9	13.5	14.32	13.51	15.8	193
1995	4	JP4	61.9	13.9	14.29	12.01	14.6	107
1995	7	JP4	4.9	14.4	14.40	14.40	14.4	1
1995	8	JP4	0.1	13.6	14.37	13.90	14.9	3
1996	8	JP4	0.7	14.3	14.30	14.30	14.3	2

Table 30

**Values of JP5 for Hydrogen Content by Region**

(Volume in Millions of Gallons)

(Spec = 13.4% min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	13.5	13.60	13.61	13.7	6
1990	5	JP5	32.8	13.4	13.48	13.48	13.8	26
1991	2	JP5	5.9	13.8	13.82	13.81	13.9	9
1991	3	JP5	298.5	13.4	13.95	13.98	15.1	145
1991	5	JP5	159.0	13.4	13.60	13.61	14.1	100
1992	2	JP5	6.0	13.4	13.74	13.73	13.9	8
1992	3	JP5	232.9	13.4	13.84	13.83	15.2	105
1992	5	JP5	137.6	13.4	13.46	13.46	14.7	79
1993	3	JP5	266.9	13.4	13.87	13.87	14.7	123
1993	5	JP5	5.0	13.7	13.70	13.70	13.7	3
1993	7	JP5	55.6	13.7	13.86	13.87	14.2	9
1994	3	JP5	125.4	13.6	13.76	13.76	14.1	49
1994	7	JP5	23.5	13.8	14.00	14.01	14.4	7
1995	3	JP5	10.5	13.6	13.84	13.77	14.0	23
1995	7	JP5	23.1	13.7	13.85	13.83	14.0	8
1996	3	JP5	240.4	13.5	13.94	13.96	14.5	98
1996	5	JP5	29.5	13.4	13.56	13.30	13.6	8
1996	7	JP5	70.64	13.4	14.02	14.02	15.1	22
1996	8	JP5	9.7	13.8	13.85	13.85	13.9	2

*Table 31*

**Values of JP8 for Hydrogen Content by Region**

(Volume in Millions of Gallons)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	13.4	13.53	13.54	13.8	7
1991	5	JP8	8.5	13.4	13.55	13.55	13.9	14
1991	8	JP8	3.9	13.6	13.60	13.60	13.6	3
1992	5	JP8	4.4	13.4	13.49	13.49	13.6	7
1992	8	JP8	8.3	13.4	13.67	13.65	13.8	18
1993	3	JP8	53.9	13.4	13.73	13.11	14.1	66
1993	5	JP8	118.4	13.4	13.57	13.63	13.9	66
1993	7	JP8	20.6	13.5	13.67	13.71	13.9	11
1993	8	JP8	20.6	13.6	13.75	13.77	14.1	11
1994	2	JP8	28.5	13.6	13.89	13.91	14.0	20
1994	3	JP8	303.0	13.4	13.74	13.70	14.2	281
1994	5	JP8	151.1	13.4	13.60	13.63	14.7	88
1994	7	JP8	5.7	13.8	13.90	13.91	14.0	3
1994	8	JP8	43.1	13.4	13.68	13.66	14.0	31
1995	1	JP8	2.9	13.5	13.60	13.61	13.8	30
1995	2	JP8	126.6	13.6	13.87	13.87	14.1	83
1995	3	JP8	455.4	13.4	13.79	13.79	14.5	326
1995	4	JP8	9.9	13.6	13.81	13.83	14.0	16
1995	5	JP8	239.3	13.4	13.56	13.62	14.5	154
1995	7	JP8	65.1	13.7	13.89	13.90	14.2	21
1995	8	JP8	96.4	13.5	13.80	13.84	14.2	115
1996	1	JP8	18.8	13.5	13.64	13.78	14.3	61
1996	2	JP8	182.6	13.5	13.87	13.87	14.8	120
1996	3	JP8	608.8	13.4	13.77	13.73	14.3	366
1996	4	JP8	76.4	13.4	13.80	13.78	14.1	81
1996	5	JP8	412.7	12.4	13.62	13.68	14.7	217
1996	6	JP8	39.9	14.0	14.10	14.09	14.3	8
1996	7	JP8	259.5	13.4	13.86	13.95	15.0	106
1996	8	JP8	150.5	13.4	13.89	13.95	14.2	140

NATO/CEPS JA1 Min/Max: "13.4 - 14.4%". Mean of 13.7%.

***Table 32***

***Values of JP5 for Distillation 10% Recovered by Region***

(Volume in Millions of Gallons)

(Spec = 205°C max, "R" Revision = 206°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	3	JP5	15.0	187	190.83	190.85	194	6
1990	5	JP5	32.8	193	197.24	197.32	199	26
1991	2	JP5	5.9	187	192.67	192.85	194	9
1991	3	JP5	298.5	184	191.98	191.77	205	145
1991	5	JP5	159.0	183	197.26	197.24	201	100
1992	2	JP5	6.0	192	194.38	194.30	196	8
1992	3	JP5	232.9	186	191.98	191.79	203	105
1992	5	JP5	137.6	172	193.17	193.74	202	79
1993	3	JP5	266.9	93	187.97	186.29	202	123
1993	5	JP5	5.0	190	190.33	190.75	191	3
1993	7	JP5	55.6	185	198.77	199.58	204	9
1994	3	JP5	125.4	164	172.76	169.94	202	49
1994	7	JP5	23.5	187	197.29	196.42	202	7
1995	3	JP5	10.5	171	176.17	191.96	198	23
1995	7	JP5	23.1	186	195.99	197.76	203	8
1996	3	JP5	240.4	169	173.55	173.42	194	98
1996	5	JP5	29.5	169	192.67	189.49	199	9
1996	7	JP5	70.6	179	190.91	190.71	200	22
1996	8	JP5	9.7	189	189.50	189.50	191	2



***Table 33***

***Values of JP8 for Distillation 10% Recovered by Region***

(Volume in Millions of Gallons)

(Spec = 205°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	193	196.64	196.45	199	7
1991	5	JP8	8.5	195	197.56	197.59	200	14
1991	8	JP8	3.9	155	162.50	162.50	167	3
1992	5	JP8	4.4	195	197.46	197.46	199	7
1992	8	JP8	8.3	163	165.40	165.43	174	18
1993	3	JP8	53.9	167	181.54	184.43	199	69
1993	5	JP8	118.4	63	149.49	154.23	177	66
1993	7	JP8	20.6	164	173.36	174.39	185	11
1993	8	JP8	20.6	162	165.22	165.94	167	11
1994	2	JP8	28.5	175	182.50	183.18	194	20
1994	3	JP8	303.0	165	182.19	181.50	199	281
1994	5	JP8	151.1	141	149.92	156.40	177	88
1994	7	JP8	5.7	163	168.33	168.82	171	3
1994	8	JP8	43.1	161	167.84	167.67	174	31
1995	1	JP8	2.9	177	185.40	184.91	197	30
1995	2	JP8	126.6	176	182.91	182.85	191	83
1995	3	JP8	455.4	150	181.12	178.84	197	326
1995	4	JP8	9.9	171	178.38	178.08	188	16
1995	5	JP8	239.3	141	154.14	158.60	190	154
1995	7	JP8	65.1	164	176.79	178.28	198	21
1995	8	JP8	96.4	160	167.44	165.98	175	115
1996	1	JP8	18.8	167	183.02	173.37	197	61
1996	2	JP8	182.6	168	180.28	180.50	191	120
1996	3	JP8	608.8	161	180.65	180.06	196	366
1996	4	JP8	76.4	158	171.04	170.78	188	81
1996	5	JP8	412.7	148	166.49	163.33	198	217
1996	6	JP8	39.9	162	165.13	164.96	168	8
1996	7	JP8	259.5	164	172.31	172.31	193	106
1996	8	JP8	150.5	158	165.73	166.85	183	140

NATO/CEPS JA1 Min/Max: "157.0 - 199.0°C" Mean of 171°C

**Table 34**

***Values of JP4 for Distillation 50% Recovered by Region***

(Volume in Millions of Gallons)

(Spec = 190°C max, "R" = 125°C, min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	117	139.07	129.69	151	3
1990	3	JP4	14.4	111	121.27	141.82	157	27
1990	4	JP4	28.1	117	130.53	135.49	153	33
1990	5	JP4	53.3	118	126.05	123.29	140	28
1990	8	JP4	11.2	105	112.63	116.12	127	8
1991	1	JP4	46.4	122	135.17	134.47	162	36
1991	2	JP4	200.0	99	135.23	129.38	162	163
1991	3	JP4	803.8	108	135.78	138.40	174	409
1991	4	JP4	55.0	116	140.15	143.49	164	93
1991	5	JP4	190.4	115	129.37	128.37	154	96
1991	8	JP4	59.5	107	111.34	112.77	122	43
1992	1	JP4	21.2	132	140.16	140.52	151	17
1992	2	JP4	134.9	98	135.03	133.56	161	107
1992	3	JP4	502.2	102	136.39	141.44	214	354
1992	4	JP4	29.4	103	138.66	138.87	165	78
1992	5	JP4	165.7	115	133.60	130.02	165	100
1992	8	JP4	5.3	113	122.50	117.03	145	4
1993	2	JP4	149.7	92	118.16	107.83	137	83
1993	3	JP4	351.5	106	136.86	149.10	218	404
1993	4	JP4	90.2	103	131.33	129.04	162	194
1993	5	JP4	80.3	99	129.06	125.48	153	85
1994	2	JP4	72.0	98	121.05	115.14	135	52
1994	3	JP4	27.2	127	154.37	156.03	175	18
1994	4	JP4	103.9	101	135.92	135.48	181	204
1995	4	JP4	61.9	120	138.23	139.19	178	134
1995	7	JP4	4.9	131	131.00	131.00	131	1
1995	8	JP4	0.1	119	124.00	126.17	127	3
1996	8	JP4	0.7	121	122.00	122.50	123	2

**Table 35**

***Values of JP4 for Distillation 90% Recovered by Region***

(Volume in Millions of Gallons)

(Spec = 245°C max, "R" = Report)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	2	JP4	2.2	153	204.26	182.14	231	3
1990	3	JP4	14.4	150	173.54	213.84	223	27
1990	4	JP4	28.1	165	190.72	182.62	226	33
1990	5	JP4	53.3	164	189.27	186.72	211	28
1990	8	JP4	11.2	148	187.39	185.02	220	8
1991	1	JP4	46.4	216	222.30	222.21	228	36
1991	2	JP4	200.0	151	218.42	213.21	244	163
1991	3	JP4	803.8	150	212.23	219.96	232	409
1991	4	JP4	55.0	166	195.94	193.35	226	93
1991	5	JP4	190.4	154	194.02	196.61	249	96
1991	8	JP4	59.5	156	192.88	184.56	231	43
1992	1	JP4	21.2	217	224.09	223.85	229	17
1992	2	JP4	134.9	197	222.76	221.73	238	107
1992	3	JP4	502.2	165	213.63	219.66	232	354
1992	4	JP4	29.4	167	195.13	201.14	223	78
1992	5	JP4	165.7	160	207.32	204.35	244	100
1992	8	JP4	5.3	194	204.25	198.24	229	4
1993	2	JP4	149.7	171	222.02	218.91	234	83
1993	3	JP4	351.5	171	215.89	216.64	247	404
1993	4	JP4	90.2	138	188.13	193.11	231	194
1993	5	JP4	80.3	193	218.60	216.52	242	85
1994	2	JP4	72.0	154	199.19	205.00	229	52
1994	3	JP4	27.2	184	207.73	203.05	225	18
1994	4	JP4	103.9	147	193.71	196.58	236	204
1995	4	JP4	61.9	165	201.41	201.73	237	134
1995	7	JP4	4.9	206	206.00	206.00	206	1
1995	8	JP4	0.1	237	239.33	239.58	241	3
1996	8	JP4	0.7	239	240.50	241.26	242	2

Table 36

**Values of JP4 for Final Boiling Point by Region**

(Volume in Millions of Gallons)

(Spec = 270°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	2	JP4	2.2	183	233.33	211.85	260	3
1990	3	JP4	14.4	209	227.81	249.17	261	27
1990	4	JP4	28.1	203	234.84	225.69	261	33
1990	5	JP4	53.3	187	234.18	237.60	269	28
1990	8	JP4	11.2	212	240.32	236.63	263	8
1991	1	JP4	46.4	242	256.71	257.08	266	36
1991	2	JP4	200.0	185	257.95	251.37	282	163
1991	3	JP4	803.8	194	245.85	250.83	266	409
1991	4	JP4	55.0	203	232.47	228.60	262	93
1991	5	JP4	190.4	180	238.93	244.70	294	96
1991	8	JP4	59.5	214	244.13	240.53	266	43
1992	1	JP4	21.2	254	259.38	259.86	264	17
1992	2	JP4	134.9	231	259.73	258.01	278	107
1992	3	JP4	502.2	180	246.91	249.72	266	355
1992	4	JP4	29.4	205	231.97	235.81	268	78
1992	5	JP4	165.7	184	266.53	273.99	305	100
1992	8	JP4	5.3	250	255.00	251.86	268	4
1993	2	JP4	149.7	210	257.41	253.71	269	83
1993	3	JP4	351.5	218	249.49	250.40	266	404
1993	4	JP4	90.2	162	228.42	234.21	266	193
1993	5	JP4	80.3	240	287.40	291.60	318	85
1994	2	JP4	72.0	193	242.46	247.63	265	52
1994	3	JP4	27.2	234	247.63	250.49	258	18
1994	4	JP4	103.9	172	231.28	235.13	267	204
1995	4	JP4	61.9	201	238.76	239.60	269	134
1995	7	JP4	4.9	243	243.00	243.00	243	1
1995	8	JP4	0.1	264	266.67	268.00	269	3
1996	8	JP4	0.7	263	263.50	263.25	264	2

**Table 37**

***Values of JP5 for Final Boiling Point by Region***

(Volume in Millions of Gallons)

(Spec = 300°C max)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	266	268.83	268.89	272	6
1990	5	JP5	32.8	238	251.70	251.50	257	26
1991	2	JP5	5.9	238	243.00	243.46	249	9
1991	3	JP5	298.5	236	235.58	248.68	281	145
1991	5	JP5	159.0	247	255.40	256.01	272	100
1992	2	JP5	6.0	246	253.38	253.28	260	8
1992	3	JP5	232.9	190	255.27	252.21	347	105
1992	5	JP5	137.6	251	261.72	263.05	304	79
1993	3	JP5	266.9	234	250.69	250.34	306	123
1993	5	JP5	5.0	272	276.67	279.60	282	3
1993	7	JP5	55.6	249	256.56	257.26	260	9
1994	3	JP5	125.4	241	273.36	276.14	309	49
1994	7	JP5	23.5	245	255.57	254.97	260	7
1995	3	JP5	10.5	266	276.04	270.68	287	23
1995	7	JP5	23.1	244	255.05	255.77	263	8
1996	3	JP5	240.4	254	278.11	278.10	286	98
1996	5	JP5	29.5	255	265.89	275.61	312	9
1996	7	JP5	70.6	233	251.13	251.28	261	22
1996	8	JP5	9.7	258	259.25	259.25	261	2

**Table 38**

**Values of JP8 for Final Boiling Point by Region**

(Volume in Millions of Gallons)

(Spec = 300°C max)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	238	250.07	249.73	257	7
1991	5	JP8	8.5	251	254.34	254.39	259	14
1991	8	JP8	3.9	244	254.50	254.50	260	3
1992	5	JP8	4.4	251	254.47	254.47	258	7
1992	8	JP8	8.3	256	266.57	265.20	269	18
1993	3	JP8	53.9	242	259.60	264.55	277	69
1993	5	JP8	118.4	208	304.76	297.74	318	66
1993	7	JP8	20.6	236	247.18	247.82	256	11
1993	8	JP8	20.6	267	276.09	277.45	282	11
1994	2	JP8	28.5	245	253.45	253.83	272	20
1994	3	JP8	303.0	224	258.14	260.11	278	281
1994	5	JP8	151.1	270	302.73	294.46	326	88
1994	7	JP8	5.7	232	233.67	233.46	236	3
1994	8	JP8	43.1	267	280.57	282.15	294	31
1995	1	JP8	2.9	256	265.10	264.68	279	30
1995	2	JP8	126.6	246	255.33	255.31	272	83
1995	3	JP8	455.4	214	263.16	264.98	283	326
1995	4	JP8	9.9	236	255.38	256.70	289	16
1995	5	JP8	239.3	209	301.57	293.65	330	154
1995	7	JP8	65.1	233	246.72	248.49	261	21
1995	8	JP8	96.4	264	274.91	277.50	296	115
1996	1	JP8	18.8	250	261.69	256.92	272	61
1996	2	JP8	182.6	221	254.33	254.91	275	120
1996	3	JP8	608.8	238	262.97	265.36	284	366
1996	4	JP8	76.4	235	259.53	261.96	276	81
1996	5	JP8	412.7	255	290.29	293.41	319	217
1996	6	JP8	39.9	278	283.13	282.76	290	8
1996	7	JP8	259.5	231	255.36	255.28	300	106
1996	8	JP8	150.5	248	273.01	271.01	290	140

NATO/CEPS JA1 Min/Max: "223.0 - 280.0°C". Mean of 252°C.

**Table 39**

***Values of JP5 for Flash Point by Region***

(Volume in Millions of Gallons)

(Spec = 60°C min)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	61	63.15	63.05	64	6
1990	5	JP5	32.8	61	62.82	62.95	63	26
1991	2	JP5	5.9	62	64.08	64.00	68	9
1991	3	JP5	298.5	60	63.70	63.78	69	145
1991	5	JP5	159.0	60	62.73	62.64	71	100
1992	2	JP5	6.0	62	65.42	65.29	69	8
1992	3	JP5	232.9	60	63.57	63.90	70	105
1992	5	JP5	137.6	60	64.57	64.34	71	79
1993	3	JP5	266.9	60	63.28	63.29	69	123
1993	4	JP5	0.4	64	64.44	64.44	64	1
1993	5	JP5	5.0	63	63.67	63.05	65	3
1993	7	JP5	55.6	61	68.00	68.08	70	9
1994	3	JP5	125.4	60	62.59	62.73	65	49
1994	7	JP5	23.5	62	65.86	65.46	70	7
1995	3	JP5	10.5	60	61.53	63.23	65	23
1995	7	JP5	23.1	61	67.25	68.29	72	8
1996	3	JP5	240.4	60	62.07	62.08	65	98
1996	5	JP5	29.5	60	61.22	61.78	63	9
1996	7	JP5	70.6	60	63.82	63.77	70	22
1996	8	JP5	9.7	62	62.00	62.00	62	2

**Table 40**

**Values of JP8 for Flash Point by Region**

(Volume in Millions of Gallons)

(Spec = 38°C min)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	40	50.73	48.53	64	7
1991	5	JP8	8.5	41	58.52	58.39	64	14
1991	8	JP8	3.9	40	39.83	39.83	41	3
1992	5	JP8	4.4	60	62.06	62.07	63	7
1992	8	JP8	8.3	40	41.12	41.12	43	18
1993	3	JP8	53.9	42	50.56	52.39	60	69
1993	5	JP8	118.4	43	46.11	46.82	54	66
1993	7	JP8	20.6	44	50.27	50.00	61	11
1993	8	JP8	20.6	39	40.90	40.21	43	11
1994	2	JP8	28.5	42	53.05	52.60	60	20
1994	3	JP8	303.0	40	52.38	52.81	68	281
1994	5	JP8	151.1	42	46.28	47.23	56	88
1994	7	JP8	5.7	45	46.33	46.45	47	3
1994	8	JP8	43.1	39	40.90	40.77	43	31
1995	1	JP8	2.9	40	52.80	52.39	63	30
1995	2	JP8	126.6	40	51.65	51.77	59	83
1995	3	JP8	455.4	38	51.14	50.43	66	326
1995	4	JP8	9.9	43	47.20	47.01	51	16
1995	5	JP8	239.3	44	49.52	50.52	63	154
1995	7	JP8	65.1	42	49.93	50.50	69	21
1995	8	JP8	96.4	38	40.99	40.68	46	115
1996	1	JP8	18.8	40	49.54	43.15	60	61
1996	2	JP8	182.6	42	51.12	51.02	66	120
1996	3	JP8	608.8	39	50.53	49.99	70	366
1996	4	JP8	76.4	38	45.36	44.88	64	81
1996	5	JP8	412.7	40	48.68	49.77	62	217
1996	6	JP8	39.9	42	45.25	45.39	51	8
1996	7	JP8	259.5	39	44.81	45.51	64	106
1996	8	JP8	150.5	38	41.97	43.72	50	140

NATO/CEPS JA1 Min/Max: "38 - 74.0°C". Mean of 43.6°C.



**Table 41**

***Values of JP5 for Cetane Index by Region***

(Volume in Millions of Gallons)

(Spec = Report)

<b>Year</b>	<b>Region</b>	<b>Fuel</b>	<b>Volume</b>	<b>Min</b>	<b>Avg</b>	<b>WtAvg</b>	<b>Max</b>	<b>Count</b>
1990	3	JP5	15.0	40.9	42.32	42.43	44.5	6
1990	5	JP5	32.8	39.8	40.35	40.36	40.8	26
1991	2	JP5	5.9	35.8	43.62	44.08	45.0	9
1991	3	JP5	298.5	39.5	44.38	43.56	48.0	142
1991	5	JP5	159.0	33.2	40.31	40.24	41.7	100
1992	2	JP5	6.0	42.8	44.26	44.25	45.0	8
1992	3	JP5	232.9	39.4	43.75	42.29	47.0	101
1992	5	JP5	137.6	37.0	40.87	40.90	42.6	79
1993	3	JP5	266.9	42.0	45.65	45.85	64.6	122
1993	4	JP5	0.4	45.3	45.30	45.30	45.3	1
1993	5	JP5	5.0	36.3	36.57	36.39	37.0	3
1993	7	JP5	55.6	23.0	40.83	41.85	44.5	9
1994	3	JP5	125.4	40.8	43.98	44.13	47.7	49
1994	7	JP5	23.5	43.0	44.36	44.35	45.5	7
1995	3	JP5	10.5	36.0	45.37	38.78	48.0	23
1995	7	JP5	23.1	41.1	44.54	44.16	46.0	8
1996	3	JP5	240.4	24.9	46.53	46.36	48.8	97
1996	5	JP5	29.5	39.0	42.00	42.76	47.1	9
1996	7	JP5	70.6	40.8	44.24	44.15	47.5	22
1996	8	JP5	9.7	46.0	47.00	47.00	48.0	2

Table 42

**Values of JP8 for Cetane Index by Region**

(Volume in Millions of Gallons)

(Spec = Report)

Year	Region	Fuel	Volume	Min	Avg	WtAvg	Max	Count
1990	5	JP8	4.0	39.8	40.27	40.25	40.5	7
1991	5	JP8	8.5	40.5	40.97	40.99	41.6	14
1991	8	JP8	3.9	35.0	35.67	35.67	36.0	3
1992	5	JP8	4.4	40.8	41.33	41.33	41.9	7
1992	8	JP8	8.3	41.8	42.35	34.84	42.9	17
1993	3	JP8	53.9	41.0	44.24	44.71	53.5	69
1993	5	JP8	118.4	36.0	41.38	40.11	43.0	65
1993	7	JP8	20.6	32.0	37.51	39.52	46.0	11
1993	8	JP8	20.6	40.0	41.95	41.75	44.0	11
1994	2	JP8	28.5	38.8	43.34	32.99	46.2	16
1994	3	JP8	303.0	28.0	43.28	42.46	49.7	281
1994	5	JP8	151.1	37.0	41.45	40.51	43.0	88
1994	7	JP8	5.7	34.0	41.40	42.08	45.6	3
1994	8	JP8	43.1	37.0	40.76	40.51	45.2	31
1995	1	JP8	2.9	37.6	40.08	40.00	42.6	30
1995	2	JP8	126.6	42.3	44.77	39.92	47.0	76
1995	3	JP8	455.4	35.5	43.81	42.86	49.1	326
1995	4	JP8	9.9	39.0	43.49	43.76	45.6	16
1995	5	JP8	239.3	37.0	41.49	40.84	43.0	154
1995	7	JP8	65.1	34.0	42.95	43.97	47.0	21
1995	8	JP8	96.4	27.4	41.84	41.06	49.0	115
1996	1	JP8	18.8	37.3	41.14	40.77	45.9	50
1996	2	JP8	182.6	37.0	43.87	44.00	46.3	120
1996	3	JP8	608.8	35.7	44.23	43.86	60.0	365
1996	4	JP8	76.4	35.0	41.67	41.57	46.1	81
1996	5	JP8	412.7	38.4	40.83	40.83	45.0	217
1996	6	JP8	39.9	44.5	46.13	46.11	49.0	8
1996	7	JP8	259.5	37.0	43.38	38.60	52.0	81
1996	8	JP8	150.5	37.1	41.36	42.53	47.4	140

Table 43

**Values of JP4 for Net Heat of Combustion by Region**

(Volume in Millions of Gallons)

(Spec Aniline-Gravity = 5250 min, Net Heat = 18400 BTU or 42.8 MJ/kg min)

Year	Region	Fuel	AG Min	AG Avg	AG Max	BTU Min	BTU Avg	BTU Max	MJ Min	MJ Avg	MJ Max
1990	2	JP4	6498	6508	6526	18621	18621	18621	44.2	44.3	44.3
1990	3	JP4	6694	7032	8080	18631	18658	18707			
1990	4	JP4	5940	7103	7840	18703	18723	18773			
1990	5	JP4	6445	6667	6885	18198	18626	18716	43.4	43.4	43.4
1990	8	JP4	6144	6510	7137	18475	18656	18756			
1991	1	JP4	7360	7618	8106	18728	18757	18787			
1991	2	JP4	6297	6894	8178	18666	18748	18839	43.4	44.0	44.3
1991	3	JP4	4382	7219	8520	18601	18683	18784	43.4	43.4	43.4
1991	4	JP4	6578	7129	7920	18658	18723	18798	43.4	43.4	43.4
1991	5	JP4	6140	6537	6842	18599	18708	18758	43.3	43.4	43.4
1991	8	JP4	5383	6580	7046	18530	18697	18787			
1992	1	JP4	7689	7846	7966	18759	18776	18809			
1992	2	JP4	6360	7090	8233	18709	18780	18842	43.4	43.5	43.6
1992	3	JP4	6023	7105	8421	18611	18682	18790			
1992	4	JP4	6093	7096	8080	18620	18736	18822			
1992	5	JP4	6248	6458	6762	18654	18670	18707	43.3	43.4	43.5
1992	8	JP4				18642	18694	18736			
1993	2	JP4	6535	7106	8037				43.5	43.6	43.7
1993	3	JP4	6160	7058	8265	18621	18652	18790	43.4	43.5	43.6
1993	4	JP4	5823	7026	9129	18435	18705	18824			
1993	5	JP4	6328	6680	6969	18640	18657	18676			
1993	8	JP4	5250	5250	5250				42.8	42.8	42.8
1994	2	JP4	6420	7043	7727				43.0	43.5	43.8
1994	3	JP4	6990	7415	8222				43.5	43.5	43.5
1994	4	JP4	6138	7087	8051	18417	18682	18848	43.4	43.5	43.6
1995	4	JP4	6474	6519	6564	18445	18680	18781	43.5	43.5	43.6
1995	7	JP4							43.5	43.5	43.5
1995	8	JP4							44.0	44.0	44.0
1996	8	JP4							44.0	44.0	44.0

Table 44

**Values of JP5 for Net Heat of Combustion by Region**

(Volume in Millions of Gallons)

(Spec Aniline-Gravity = 4500 min, Net Heat = 18300 BTU or 42.6 MJ/kg min)

Year	Region	Fuel	AG Min	AG Avg	AG Max	BTU Min	BTU Avg	BTU Max	MJ Min	MJ Avg	MJ Max
1990	3	JP5	5404	5642	5851						
1990	5	JP5							42.8	43.0	43.1
1991	2	JP5	6307	6386	6482						
1991	3	JP5	5494	6140	6527	18498	18544	18568			
1991	5	JP5	4931	5093	5583				43.0	43.0	43.0
1992	2	JP5	6163	6291	6409						
1992	3	JP5	5831	6081	6371	18509	18537	18639			
1992	5	JP5	5202	5354	5582				43.0	43.0	43.0
1993	3	JP5	5873	6201	6482	18533	18575	18594	43.2	43.2	43.2
1993	5	JP5	5134	5220	5268						
1993	7	JP5	5414	5832	6112						
1994	3	JP5	5541	5964	6333				43.2	43.2	43.2
1994	7	JP5	5781	6091	6567						
1995	3	JP5	5009	6049	6408						
1995	7	JP5	5859	6360	6688						
1996	3	JP5	4899	6142	6525						
1996	5	JP5	5224	5408	5840				41.6	42.6	43.1
1996	7	JP5	5894	6187	6658				42.2	43.0	43.3
1996	8	JP5							43.1	43.2	43.3

**Table 45**

***Values of JP8 for Net Heat of Combustion by Region***

(Volume in Millions of Gallons)

(Spec Net Heat = 18400 BTU or 42.8 MJ/kg min)

Year	Region	Fuel	AG Min	AG Avg	AG Max	BTU Min	BTU Avg	BTU Max	MJ Min	MJ Avg	MJ Max
1990	5	JP8							43.0	43.0	43.1
1991	5	JP8	5208	6377	7351				43.0	43.0	43.0
1991	8	JP8	5208	5208	5208				43.1	43.1	43.2
1992	5	JP8							43.0	43.0	43.0
1992	8	JP8	6429	6429	6429	18552	18569	18588	43.2	43.2	43.2
1993	3	JP8	6155	6637	7583	18445	18600	18658	43.0	43.1	43.2
1993	5	JP8	5749	6879	7316	18492	18531	18616			
1993	7	JP8	6751	7075	8180				43.1	43.3	43.7
1993	8	JP8	6196	6727	7516	18552	18580	18669			
1994	2	JP8	5810	5810	5810	18549	18605	18639			
1994	3	JP8	5810	5953	7410	18474	18588	18951	42.8	43.1	43.4
1994	5	JP8	5810	6153	7410	18485	18515	18580			
1994	7	JP8	5913	5913	5913				43.3	43.5	43.6
1994	8	JP8	5810	6080	7410	18494	18553	18629			
1995	1	JP8							43.1	43.1	43.2
1995	2	JP8	5913	6153	7352	18540	18613	18645	43.1	43.2	43.2
1995	3	JP8	5913	6274	6825	18523	18615	19188	42.8	43.2	43.8
1995	4	JP8				18557	18603	18632	43.2	43.2	43.3
1995	5	JP8	5828	6263	6396	18483	18523	18611	43.0	43.0	43.1
1995	7	JP8	5913	5913	5913				43.2	43.3	43.7
1995	8	JP8	5913	5913	5913	18514	18558	18689	42.8	43.2	43.4
1996	1	JP8							43.1	43.1	43.3
1996	2	JP8				18500	18606	18647	43.1	43.2	43.3
1996	3	JP8	5843	6266	6402	15585	18562	18950	43.0	43.2	43.4
1996	4	JP8				18544	18605	18649	42.8	43.2	43.2
1996	5	JP8	5857	6183	6793	15566	18503	18984	43.0	43.0	43.1
1996	6	JP8							43.3	43.4	43.4
1996	7	JP8	5571	5948	6283				43.1	43.2	43.4
1996	8	JP8	5665	5692	5719	15589	18493	18975	43.1	43.7	46.7

NATO/CEPS JA1 Min/Max: "43.0 - 46.9 MJ/kg". Mean of 43.3 MJ/kg.